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Rural-urban policy effects on the regional economies of South Ostrobothnia and North Karelia

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ACADEMIC DISSERTATION

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Abstract

The thesis studies rural and regional policy effects on the rural economies of South Ostrobothnia and North Karelia. In addition, it investigates whether the applied policies accelerate economic agglomeration towards the urban centres of these regions.

The analysis is based on the economic linkages among the economic agents and among the rural and urban areas. Rural-urban social accounting matrices (SAM) were built on the regions and used as base year data for the multiplier and computable general equilibrium (CGE) models, by which the sets of policy simulation were carried out. The specifications of the shocks aim at reflecting the choices of the rural policy makers as the policies and sectors having an ability of enhancing rural development. Thus the simulations consist of agricultural policy changes (e.g. CAP pillar II modulation), transport-infrastructure policies (investments and R&D policies) and increases in tourism demand (e.g. through intensified marketing efforts).

The results indicate that the magnitude, and in some cases, the directions of the effects were area specific. South Ostrobothnia, for which the food cluster is important, responded relatively more strongly to the agricultural policies. The infrastructure and tourism policies also increased Regional Gross Domestic Product and employment. In addition, regional exports proved to have an important role for the region. On the other hand, the transfer of agricultural subsidy to the farm diversification did not increase RGDP since the traditional agriculture, due to its linkages, utilised the subsidies more effectively.

In contrast, North Karelia was more responsive towards the infrastructure and tourism policies. The strengthening of the local services would effectively promote economic development in North Karelia. The results suggest that the increased efficiency of the transportation sector could slow down agglomeration in a highly remote area. Moreover, the subsidy transfer to the farm diversification resulted in increases in RGDP and employment. Yet, regarding both the regions and most of the policy shocks, the positive effects tend to accumulate in the urban areas.

In conclusion, provided that the goal is to strengthen overall regional development, the acceptance of the urban centres as the engines of development would be preferable, since they are able to spill over benefits also to the rural surroundings. As a consequence, however, the economic activity and population further concentrate in the urban areas. In contrast, in order to support the genuinely rural areas, more targeted measures are called for. Since the effects were area-specific, the findings highlight the role of the local actors and thus emphasise the importance of sensitivity towards the diversity of local circumstances.

Keywords: rural policies, regional policies, agglomeration, Computable General Equilibrium, Social Accounting Matrix

Tiivistelmä

Maaseutu- ja aluepolitiikkojen tavoitteena on turvata tasapuolinen aluekehitys koko Suomessa. Väitöskirjassa tutkitaan, kasautuvatko näillä politiikoilla saavutetut taloudelliset hyödyt aidolle maaseudulle vai tutkimusmaakuntien kaupunkikeskuksiin. Tutkimusalueina ovat Etelä-Pohjanmaa ja Pohjois-Karjala ja näiden keskuskaupungit Seinäjoki ja Joensuu. Tavoitteena on lisäksi selvittää, onko samoilla politiikoilla erilaisia vaikutuksia eri alueilla.

Tutkimuksessa maakunnista rakennettiin maaseudun ja kaupungin erottelevat sosiaalisen tilinpidon matriisit (SAM). Nämä aluetalouden rahavirtoja kuvaavat matriisit ovat perusaineistona SAM-kerroinanalyyseillä ja yleisen tasapainon mallilla tehdyissä politiikkasimulaatioissa. Tutkimuksen simulaatiot kuvastavat Euroopan unionin, kansallisten ja paikallisten politiikantekijöiden näkemyksiä maaseutualueiden kehitystä parhaiten tukevista maaseutu- ja aluepolitiikoista. Työssä simuloidaan maataloustuen siirtoa maatilojen muuhun yritystoimintaan, paikallisen infrastruktuurin kehittämistä ja investointien ja turismin kasvua.

Tuloksissa vertaillaan politiikkojen suhteellisia vaikutuksia maakunnittain ja maaseutu- ja kaupunkialueittain. Etelä-Pohjanmaalla ruokaklusterin tärkeys korostui. Myös elintarvikkeiden vienti ja maataloussektorin kautta tulevat tuet olivat tärkeitä maakunnalle. Sen sijaan maataloustuen siirtäminen varsinaisesta maataloudesta maatilojen monialaistumiseen vähensi alueellista arvonlisäystä. Tulosten taustalta ovat maatalouden kytkökset ja kerroinvaikutukset maakunnassa. Infrastruktuuri- ja turismipolitiikat kasvattivat alueellista arvonlisäystä ja työllisyyttä.

Pohjois-Karjala reagoi Etelä-Pohjanmaata suhteellisesti voimakkaammin infrastruktuuri- ja turismipolitiikkoihin. Myös paikallisten palveluiden kehittämisen tärkeys korostui. Maataloustuen osittainen siirtäminen maatilojen yhteydessä olevaan muuhun yritystoimintaan lisäsi alueellista arvonlisäystä. Tutkimuksen mukaan lisäpanostukset infrastruktuuriin hidastavat keskittymiskehitystä harvaan asutussa Pohjois-Karjalassa.

Suurempi osuus saavutetuista hyödyistä kasautui keskuskaupunkeihin kummassakin maakunnassa ja useimpien politiikkasimulaatioiden seurauksena. Jos tavoitteena on koko maakunnan kehitys, keskuskaupungit voivat toimia maakuntien vetureina, koska ne kykenevät levittämään hyötyjä myös ympäröivälle maaseudulle. Kääntöpuolena on taloudellisen toimeliaisuuden kasautuminen keskuksiin. Aitojen maaseutualueiden tukemiseen sen sijaan tarvitaan tarkemmin kohdennettuja politiikkoja. Samojen politiikkojen erilaiset alueelliset vaikutuksen korostavat paikallisen asiantuntemuksen ja alueiden erityispiirteiden huomioimisen tärkeyttä.

Asiasanat: maaseutupolitiikka, aluepolitiikka, agglomeraatio, sosiaalisen tilinpidon matriisi, yleisen tasapainon malli

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1 Introduction

In Finland, rural development has traditionally been supported by a mix of separate regional, agricultural and rural policies. Recently, however, applied policy measures have been transformed from previously typical sector-specific income support towards measures that would be able to underpin competitiveness and in addition, take account of area specific economic and social needs. These measures aim at reinforcing long-term structural changes, enhancing the competitiveness of rural enterprises, improving rural employment and promoting spatial and regional equality and cohesion. Such development follows the path chosen by the European Union, which calls for more coherent rural and cohesion policies and coordination among EU funds.

European rural policy is settled at the boundary of the two major interests and concerns of the European Union. The first is structural policy, which concerns the promotion of productivity, competitiveness of economic activities, and simultaneously, equity among countries, regions and sectors. The second is agricultural policy, which aims at securing farm incomes and rural livelihood, and sustainable development of agriculture. Within the EU, the term rural development is most often used in the context of the CAP Second Pillar, while in the regional policy context it is used more generally over a variety of measures that aim at enhancing welfare in rural areas. (Thomson et al. 2010.)

Regional economics addresses where and why economic activity takes place. In addition to traditional economics, regional economics draws on location theory, urban economics and international trade theories (Fujita & Krugman 2004). Hence, the major concepts and methods of regional economics and economic agglomeration are grounded on these theories. The term agglomeration signifies the concentrations or clusters that appear in terms of geographic levels (Mulligan 1984). In the 1920s, Alfred Marshall defined knowledge spillovers, the advantages of thick markets for specialised skills, and the backward and forward linkages associated with large local markets as the sources of agglomeration economies. Later, Fujita and Krugman (2004) distinguished linkages, thick markets and knowledge spillovers as the main centripetal forces that accelerate accumulation. Correspondingly, immobile factors, land rents, commuting and congestion are centrifugal forces that encourage dispersion. Another focal concept in the field of regional economics is ‘economies of scale’, which refers both to the firm level and to cluster-level mass production advantages.

In spite of a considerable number of studies on how (EU) policies affect regional development (for example Baldwin et al. 2003; Balkhausen et al. 2008; Boldrin & Canova 2001; Puga 2002; Shankar & Shah 2009), studies on whether the policies induce agglomeration or dispersion within a rural region are still relatively few. An early study was Round (1985), who constructed a bi-regional Social Accounting Matrix (SAM) for analysing the relationship between East and West Malaysia. The SAM multiplier analysis reported relatively low regional interdependencies, part of it arising from 'rather meagre data sources', which is a typical drawback on the validity of SAM analysis. Later, Roberts (1998) built a SAM in order to consider the spatial diffusion of rural-urban spillover effects in Grampian, Scotland. One of her main findings was that the rural multipliers were greater than the urban multipliers, indicating the greater income-generating potential of rural industries. In addition, inter-regional linkages were more important for urban industries, indicating that urban industries are dependent on rural household demand and rural factor services. This finding opposed the general perception that rural areas are open, without diversified economic structure and thus lack an ability to fully exploit the benefits of increased investment. By applying a corresponding multiplier model, Psaltopoulos et al. (2006) evaluated the inter-regional impacts of the CAP in two rural and one urban area in Greece. They reported that the interregional output multipliers were larger for the rural areas than for the urban area. They concluded that the rural areas were more open than the urban area, and thus leak benefits to the urban area.

Kilkenny (1993, 1998) examined the effects of farm subsidy termination and transport costs by using a rural-urban computable general equilibrium (CGE) model. She deduced (1993) that termination of farm subsidies would result in local losses in the short-run. However, the results also suggested that farm subsidies in fact undermine other rural activity. The latter study (1998) showed that reductions in transport costs facilitated concentration. Yet, the relationship between transport costs and rural development was nonlinear, such that if transport costs were high, the reductions favoured concentration, whereas if the industrial transport cost rates were relatively low, further reductions favoured the industrial development of a natural-resource-based economy. Recently, Daniel and Kilkenny (2009) studied whether coupled subsidies and single farm payments can decrease spatial agglomeration and whether the benefits of subsidising agriculture in an attempt to promote rural development can outweigh the costs. They found that only the single farm payment raised welfare in both the rural and the urban region. However, both the coupled and the single farm payments countervailed against urban agglomeration such that they encouraged firms to locate in lower-density regions.

The studies above base their analysis on the economic linkages through which the different policy shocks enter the local economy, which finally attains a new economic equilibrium. The concept of linkages among local industrial sectors is essential to virtually every theory of regional economic growth (Kraybill & Dorfman 1992). Consideration of agglomeration and dispersion through rural-urban linkages is important since rural-urban connections are often vital for the development of remote rural areas. For example, Durandon and Puga (2002) argue that, within the mature urban system, technological shocks and innovations can spill over into hinterlands. Further, rural surroundings can attain positive spread effects such as special services and urban jobs through commuting (Henry et al. 1997; Partridge et al. 2008). Nevertheless, rural specific policy measures are also needed. Henry et al. (1997) concludes that if rural-urban linkages are strong and if urban growth causes positive spillover effects, a regional approach to development would be appropriate for rural areas. On the other hand, if the linkages are weak, community-specific development programme are preferable.

This thesis examines two Finnish rural regions (NUTS3) South-Ostrobothnia and North Karelia, and their urban centres Seinäjoki and Joensuu, in such a way that the economic linkages between the rural and urban areas within the regions are at the core of the analysis. The first aim of the thesis is to explore the effects that different policy measures have on the regional economies, and whether the corresponding policy shocks have different effects on the regions due to, for example, their different economic structures.

The second aim is to consider how important a role different industries, particularly agriculture, transportation and tourism, have on the regions. These are among the industries that are often singled out as sectors which have the ability to enhance rural development. In the analysis, the emphasis is on the policy measures that would underpin the economic development of the whole regions instead of sector-specific income subsidies. In addition to the preferred policies of the EU and the national and regional policy makers that emphasise measures enhancing the overall competitiveness and development of the whole region, previous research has also found evidence that economic development policies should not be solely sector-specific. (e.g. Smith 1984; Kraybill & Dorfman 1992.)

Thirdly, and most importantly, the study examines whether the impacts are different in rural and urban areas: do the urban centres collect the benefits of the policies implemented in the rural

regions? This aim concerns whether the policy measures would result in agglomeration or dispersion of local economic activity.

In order to attain these aims, two different methods, i.e. SAM multiplier analysis and computable general equilibrium analysis are applied. Both of these methods utilise Social Accounting Matrices (SAM) as their base data. The detailed rural-urban SAMs constructed for this research are able to introduce new information on rural-urban interactions, income generation among different household groups and the role and importance of different industries in these Finnish rural regions that are remote areas from the point of view of Finland and of the EU. In addition to the results themselves, multiplier analysis is important due to its ability to show both the changes and the channels of changes illustratively and from the different perspective than the CGE analysis, and thus multiplier analysis supports the interpretations of the CGE results. The CGE analysis, in turn, is able to relax some restrictions, such as the assumption of fixed prices and immobile factors of the SAM multiplier analysis.

The thesis is structured as follows. First, a brief overview of the study regions is given. Chapter 2 introduces rural and regional policies in the European Union, in Finland and in the study regions and Chapter 3 provides an overview on regional economics. Next, the methodology and data are justified and presented in Chapters 4 and 5. The data collection and SAM construction process and multiplier analyses are presented in Chapter 4 followed by the introduction of the computable general equilibrium modelling theory and the empiric CGE model in Chapter 5. Chapters 6, 7, and 8 provide the justifications and results of the policy-specific empirical CGE analyses and finally, the thesis is concluded with a brief summary of the key findings and conclusions.

1.2 The study regions

South Ostrobothnia is located on the western coast of Finland. The region, classified as NUTS3 (EU Nomenclature of Territorial Units of Statistics), has 193,000 inhabitants, corresponding to 3.4% of the Finnish population. After the consolidation of municipalities in 2009, the regional centre of Seinäjoki today has 56,000 inhabitants. Yet, in this research the urban area refers to Seinäjoki before the consolidation, with a total of approximately 37,000 inhabitants. Agriculture and forestry account for relatively larger shares of value added (9%), employment (11%) and trade compared with the national average. An additional special feature is the high number of small businesses and the regional clusters they form (Regional Council of South Ostrobothnia 2006). South Ostrobothnia is a nationally important producer of agricultural and food products. Together with input industry, other related industries and services, education and various public actors, agriculture and food industries form the local food cluster. Several cumulative factors have affected the development of the cluster: due to the thin local markets, the food industry is export oriented, and exports both to national and international markets. In addition, there is a strong tradition of entrepreneurship and cooperative associations in the region. According to the Employment and Economic Development Centre of South Ostrobothnia (2006), the farm cooperative-based ownership structure of local food manufacturing has provided a sufficient demand for raw materials and has maintained the processing industry in the region despite the remoteness of the main market areas. Further, relatively favourable natural conditions have earned the region a competitive advantage and guided resources towards primary production. Other industries, such as input industries, industries using the side products of the food chain, and non-food industries further strengthen the food cluster. For example, the machinery industry provides know-how and dynamics for the whole food supply chain. The other main economic clusters in South Ostrobothnia are metal, wood and construction clusters. The core industries are further detailed in Chapter 4.

In contrast, North Karelia is the easternmost region of Finland. The area is characterised by a low population density of 9.3 person per land km^2 in 2011 (in Finland 17.6 and in South Ostrobothnia 14.4). The region has 166,000 inhabitants including the urban area of Joensuu which has 57,000 inhabitants. Most of the population of North Karelia is concentrated in Joensuu and its surroundings (105,000). Though the distance from Helsinki to Joensuu is 438 km, Joensuu is relatively well connected because of its airport and good train and road connections. As much as 70% of North Karelia is covered with forests. It is reasonable to claim that this area is a concentration of forest

know-how in Finland, since the European Forest Institute (EFI) and the Finnish Centre of Expertise in Wood Technology and Forestry are both located in Joensuu. In addition, the University of Joensuu has a Faculty of Forestry providing education and research in forestry. The common border (300 kilometres long) with Russia has encouraged various cross-border activities and interactions between the neighbours. In addition to forestry-related industries, the most important economic sectors are plastic, metal, stone and food. Future expectations rest on services such as tourism, welfare services, culture and ICT. Compared with the other regions of Finland, the public sector has been a relatively more important employer in North Karelia. On the other hand, the primary sector has gradually lost its significance measured both by employment and by economic importance. (Regional Council of North Karelia 2006.)

Figure 1 illustrates the population changes of these regions since the 1960s. In North Karelia, the trend has been steadily decreasing, while in South Ostrobothnia, the population has remained relatively stable. However, the South Ostrobothnia region has suffered from the outmigration of the working-age population, and simultaneously the number of pensioners has constantly been growing. Similarly, the number of the working-age population has been declining in all the North Karelia sub-regions apart from the Joensuu subregion. According to the population forecast of Statistics Finland (2009) for the period 2005-2040, population both in Norh Karelia and South Ostrobothnia will fall steadily such that in 2040, the population in North Karelia would be 143,593 and in South Ostrobothnia 180,134.

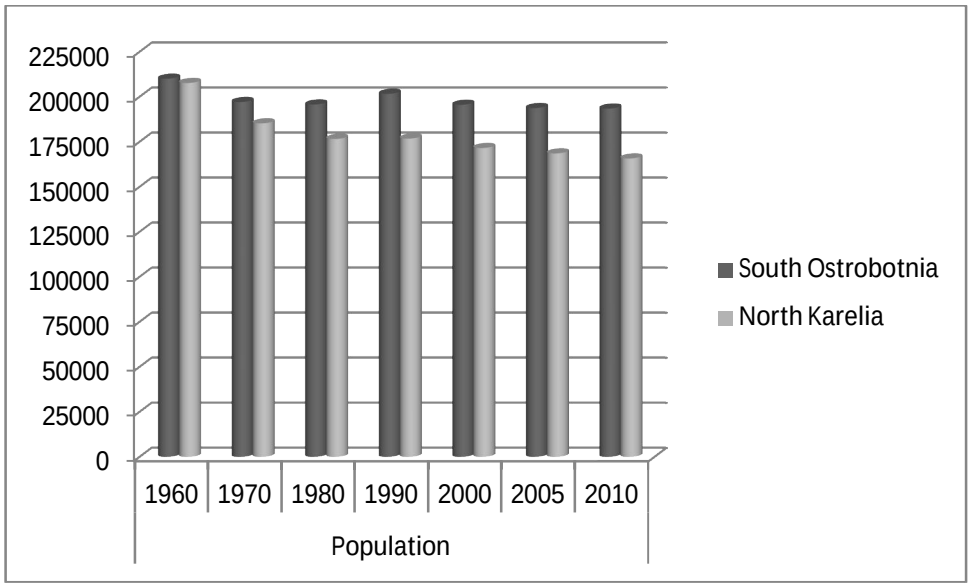


Figure 1. Population in the study regions (Statistics Finland 2011).

In both study regions, the GDP per capita is below the Finnish national average. In 2007, the regional GDP per capita in South Ostobothnia reached only 76% and in North Karelia 73% of the national average (Statistics Finland 2009). Regarding South Ostrobothnia, one explanation is that a large share of the employed are working for the sectors whose GDP per worker is below the national average. Another explanation is that the local enterprises are predominantly small enterprises. As for North Karelia, the high level of unemployment and the growing relative share of pensioners are the main factors explaining the figure. (Figure 2)

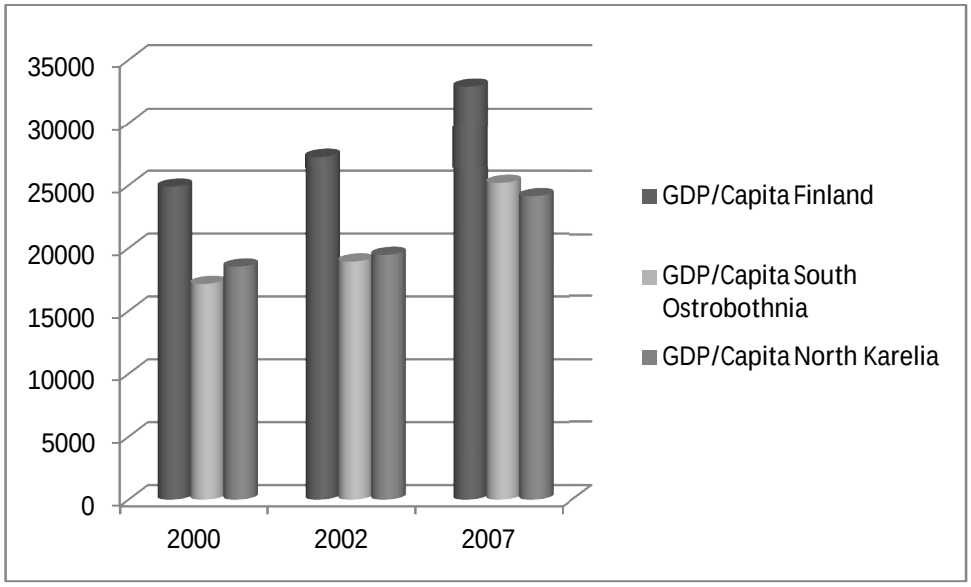


Figure 2. GDP per capita (Statistics Finland 2009).

Figure 3 shows that employment in South Ostrobothnia has been on a relatively good level such that, occasionally, the region has even achieved lower unemployment rates compared with the Finnish average. During the period 2000-2008, both employment and the local economy grew. However, this development has been twofold, for both the population and the labour force have been increasing only in the Seinäjoki subregion. By contrast, the other subregions have been suffering from outmigration and a decrease in work force (Mella 2008). During the period 2008-2009, due to the economic decline, unemployment in South Ostrobothnia grew more rapidly compared with the whole country (Kaarna & Mella 2010).

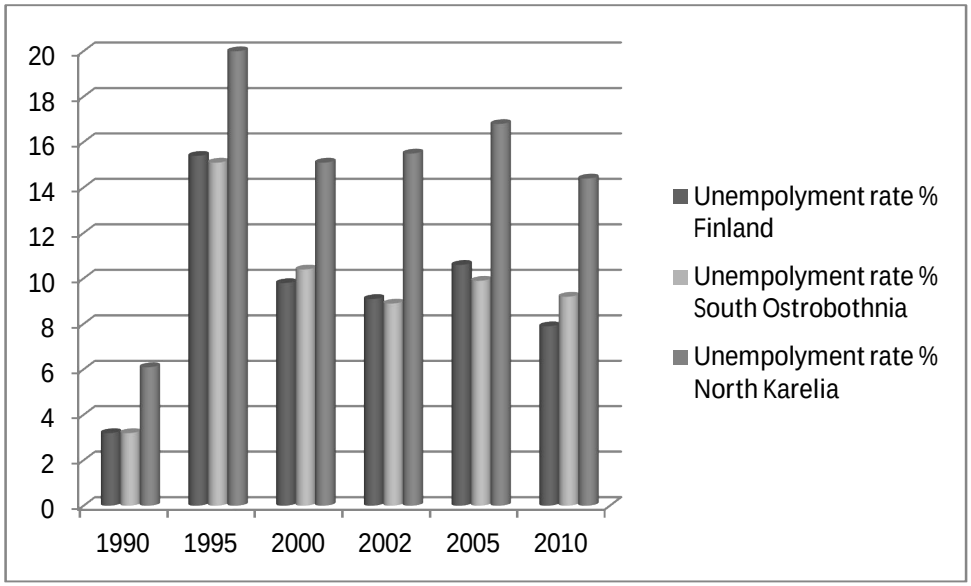


Figure 3. Unemployment rates (Statistics Finland 2011).

Unemployment has been a particular problem for North Karelia. During the recession of the early 1990s, the Finnish government significantly cut public sector expenditures. This affected employment in North Karelia. During 1995-2008, along with the recovering economy, the unemployment rate fell in all the subregions of North Karelia such that the rate of 20% in 1995 fell below 14% in 2008. Notwithstanding, the unemployment rate is still clearly above the national average. (Mella 2008.) The decline in employment restarted during the period 2007-2008 mainly due to the closures of certain large manufacturing enterprises. Therefore, North Karelia could not take advantage of the growth path before the global recession hit in the autumn of 2008. The region suffers from structural problems that arise from an aging population and outmigration. This is shown as a sharp decline in the working-age population. In 2010 and 2011, the recovery of the Finnish economy has stimulated these regional economies. Map of South Ostrobothnia and North Karelia is in Appendix 7.

Agriculture

In 2008, there were 7,390 farms in South Ostrobothnia, making up 11% of the Finnish farms and 11% of the cultivated farm land in Finland. The average farm size is 33 ha (in Finland 35 ha). The local farms own 12% of the Finnish cattle, 17% of the pigs, 22% of the poultry, and they produce 11% of the Finnish milk. In 2008, the average yield per hectare exceeded the national averages being, for example, 3,815 kg per ha for spring wheat and 4,030 kg per ha for barley (TIKE 2009).

As opposed to South Ostrobothnia, the forestry cluster is more important compared to the food cluster in North Karelia. However, agriculture is still important for this region too. In 2008, there were 2,704 farms in North Karelia, contributing 4% of the Finnish farms and 4% of the cultivated farm land in Finland. The average farm size is 32 ha. The local farms have 6% of the Finnish cattle, 0.8% of the pigs, 0.2% of the poultry and they produce 6% of the Finnish milk. Dairy production is the most important agricultural production line in North Karelia.

Local infrastructures

According to the Ministry of Transportation and Communication (2007), over 80% of the domestic freight transport volumes in Finland are industrial shipments. Since industries and production plants are scattered in different parts of Finland, good transport connections are needed throughout the country. From the point of view of transportation geography, accessibility to South Ostrobothnia is relatively good. Highways and rail connections cut through the region from South to North. In addition, there are good connections from Seinäjoki airport to Helsinki-Vantaa airport and from there to international connections. The main handicaps are the inadequate East-West connections. The road network is dense due to the evenly distributed population. However, the maintenance of this large network demands resources, and thus the condition of local roads is poor in places. Since broadband channel is considered an important factor in improving the competitiveness of the region, the building of these connections has already completed or is under construction in the central parts of the region. However, in most of the remote areas these connections are missing (Employment and Economic Development Centre of South Ostrobothnia 2006).

According to the Regional Council of North Karelia (2006), a well-functioning infrastructure is the basis for the regional competitiveness of North Karelia. From the point of view of accessibility, the good condition of the highways, and good railroad and flight connections are essential for this geographically remote area. Locally important extractive industry has its own requirements for infrastructures. A special feature of North Karelia is its location on the border between Finland and Russia. Niirala, the international border crossing point, strengthens the role of North Karelia as a transit area. Another local feature is the Saimaa canal, which provides access to Russia. Since North Karelia is a large area of low population density, the development of telecommunication links is important. Therefore, in order to meet the needs of both enterprises and people, infrastructure development is an important target for local policy makers.

Tourism

The value of tourism in Finland was 3,649 million EUR in 2007, accounting for 2.3 % of the Finnish GDP. During the same period, tourism contributed 116,897 jobs in terms of full-time equivalent. The total expenditures of domestic and international tourists amounted to 10,958 million EUR. (OECD 2010.) Nature and nature-related activities are the most important attractions for foreign visitors. Hence, the Finnish strengths as a tourist resort are its northern location, clearly distinguishable seasons, water bodies, and various natural attractions. The major weaknesses are the heterogeneity of entrepreneur skills, and the weak command of customer services and processes. In addition, marketing, networking and product development are the weak spots of the industry. (Ministry of Trade and Industry 2006.)

According to the Regional Council of North Karelia (2007), the strengths of local tourist services are hospitality, Karelian culture, local arts and crafts, landscapes and natural attractions in general. The main attraction of the region is the Koli national park. In addition, there is a good number of accommodation services and qualification in conference arrangements. Future opportunities are welfare services and the growing numbers of Russian tourists. As for South Ostrobothnia, tourism has substantially diversified during the early 2000s. Despite the fact that the region has not traditionally been a well-known tourist area, local traditions and agricultural landscapes are undisputed potential especially for Finnish travellers. Tourism resorts and enterprises, and nationally famous festivals and well-known national parks are yearly visited by hundreds of thousands of tourists. (Seinäjoen ammattikorkeakoulu 2007.)

Table 1. Key figures on regional tourism (Regional Council of North Karelia 2007; Seinäjoki University of Applied Sciences 2007).

	South Ostrobothnia 2004	North Karelia 2006
All overnights, number	571 122	470 000
Domestic overnights	551 556	415 000
International overnights	19 676	55 000
Employment in full time equivalents	1 480	1 822
Turnover of accommodation and catering -services, EUR million	264.50	98.38

Table 1 shows the different structures of tourism in South Ostrobothnia and North Karelia. The main tourist attraction of South Ostrobothnia is the Village shop Veljekset Keskinen, which attracts

visitors mainly for shopping, but also for a variety of events that are arranged by the enterprise. This single attraction accounted for approximately a third of all the tourist income of the region in 2004. North Karelia attracts considerably more foreign travellers compared with South Ostrobothnia due to its location next to the Russian border and to its beautiful forest and lake areas. Table 2 outlines the local tourism targets specified in the regional Tourism Strategies.

Table 2. The aims of the local Tourism Strategies.

South Ostrobothnia	*North Karelia*
To create prerequisites for round-the-year tourism and for the development, growth and competitiveness of a professional tourism industry.	To channel tourism funding such that the most important tourist attractions would be nationally and internationally competitive.
To prolong the duration of an average visit of a domestic tourist, and to find new ways to increase foreign tourism.	To support investments in tourism such that accommodation and programme service capacities grow to a size at which they are able to run a profitable business.
To develop consumer-oriented and high quality products and services.	To use new technologies in marketing, and make local tourism activities more efficient through networking and cooperation.
To strengthen networks and cooperation with development, marketing and sales promotion organisations.	To support a critically important infrastructure, such as quick train connections and flight connections, through the growth of tourism.
	To direct tourist services and infrastructures towards high quality, environmentally friendly services which show an awareness of local culture.

2 Policy descriptions

2.1 Regional policies in the European Union

Spatial and geographical nature are special characteristics of regional economic policy. These policies aim at solving problems arising from spatial problems or maintaining regional characteristics and structures. McCann (2001), however, stresses that our perceptions of what is local determine the nature, implementation and evaluation of the policy in question. From the point of view of the central government, regional policies have their own important function since regional disparities often have harmful political and social consequences that will be reflected at the national level. Armstrong & Taylor (1993, 194-195) in particular point at the problems arising from high unemployment that cause social problems and dissatisfaction. On the other hand, just as remote areas are facing economic decline and outmigration, attractive urban areas face a growing demand for more developed infrastructures, and an excess demand for social capital, and industrial and commercial land. In attractive areas, the low level of unemployment tends to raise wages. This higher income level leads to an increased demand for housing, which in turn raises housing prices.

Shankar & Shah (2009) conclude that regional development approaches typically address two broad questions. The first question is whether regional policy should be interventionist in nature and provide political guidance, or alternatively, should it encourage free trade, removal of barriers and free movement of people. The second important question concerns the level of governance, i.e. should the central government guide the development or should local bodies be responsible for policy formation and decision making. Table 3 below illustrates the characteristics of the free market approach and the interventionist approach. The former assumes that regional problems arise from market inefficiencies. Therefore, if markets were efficient, regional disparities would be automatically eliminated. In contrast, interventionists argue that markets are unable to solve regional problems and instead, political assistance is necessary.

Table 3. Two approaches of reducing regional economic disparities (adapted from Armstrong & Taylor 1993, 198).

	Characteristics of the free market approach	Characteristics of the interventionist approach
Political ideology	Neoclassical economics. Popular capitalism. Deregulation, privatization. Small state sector. Enterprise culture.	Reconstructed Keynesianism. Supply-side support for industry and commerce. State intervention.
Causes of regional economic disparities	Inefficiencies in problem regions due to market rigidities. Lack of entrepreneurial 'culture'.	Structural weaknesses. Low investment. Drain of financial capital to rich regions. Inadequate government participation in regional development.
Approach to reviving depressed regions	Deregulation of regional labour markets. Tax incentives to improve efficiency.	Pro-active policies at regional and local level. Public investment in infrastructure.
Regional policy	Minimal expenditure. Selective assistance.	Extensive regional aid. Decentralisation of regional policy powers to local and regional agencies.

The European Union has implemented both market-oriented and interventionist regional development policies. The creation of common markets and efforts to reduce internal barriers to trade and the movement of people, are examples of the first. Simultaneously, large amounts of EU funds have been allocated to various redistributive policies that aim at narrowing regional disparities. Problems arise from how to reconcile and implement these policies that have different and sometimes conflicting objectives.

Economic regional policies aim at improving the attractiveness of a specific region for investors and firms and thus indirectly make it more attractive for employees and households. The aim is that exogenously accelerated economic development would induce endogenous growth and eventually local welfare. Various policy instruments have been developed to serve this aim. According to McCann (2001), regional policies are typically targeted to the industrial sectors which are regarded as most sensitive to large-scale spatial costs and price variations, namely the manufacturing and distribution sectors and the service sectors that carry out routine activities. Typically, supply-side policies aim at upgrading the quality of the local production factor inputs. Armstrong & Taylor (1993) emphasise that regional policies aim at reallocating labour by stimulating labour mobility, and by reallocating capital to depressed regions. The instruments of the latter are taxes and subsidies, controls, schemes to improve access to sources of finance, and advisory services for firms. Both (Armstrong & Taylor 1993; McCann 2001) acknowledge the role of infrastructure

improvements as a tool for rural development policies. Infrastructure policies have also been used as an indirect way of reducing real local input costs.

Armstrong (2001, 2004) points out that those mistrusting the abilities of public bodies fear that, instead of promoting overall growth and wellbeing, regional policies penalise successful businesses in prosperous regions and award unviable and uncompetitive activities in depressed regions. In contrast, those who doubt the ability of free markets to overcome regional problems offer the following arguments (Armstrong 2004, 402):

- *Equity and fairness. Regional policy is seen as a way of ensuring that all parts of society can share in the benefits of a modern, growing society.*
- *Extra income and production. Regional policy is portrayed as being essential if underutilised resources, particularly unemployed labour, are to be drawn into productive use.*
- *Lower inflation and faster growth. The concentration of economic activity in a few, already prosperous regions means that during periods of economic upturn markets tend to overheat. The resulting surge in wage levels, house prices, rents etc. sends a wave of inflationary pressure rippling across the remainder of the economy and also results in a rise of imports to meet the growing demand, thus worsening the balance of payments position… Regional policy, by spreading economic activity, eases bottlenecks in the market economy. This in turn allows the economy to enjoy lower inflation and more sustained growth over time, to the benefit of all.*
- *Fewer urban problems. Economic activity in Europe is heavily concentrated in the big metropolitan areas and capital cities of the member states. The quality of life in these cities is a cause of great concern. Traffic congestion, pollution, crime and overcrowding are serious problems. Regional policy offers a way of easing the pressures on the big cities by diverting part of the economic activity elsewhere.*

How have European policies for regional development succeeded in the light of the previous research? Boldrin & Canova (2001) reviewed studies concerning EU regional policies of the EU15 during the period 1980 – 1996. Their aim was to analyse, from the point of view of theories of trade and growth, whether economic theory and available evidence support the assumption that poor regions will remain poor without transfers. They considered first which policies would maximise aggregate welfare or economic growth from the point of view of economic efficiency. The second perception concerned which policies would minimise income inequality.

Boldrin & Canova (2001) could not find evidence to support the view that the adopted EU regional policies would have been the most appropriate ones. In the light of the results, the public funds channelled to the less developed regions did not appear to enhance the capacity of the regions. They argued that the transfers simply redistributed income, and if income distribution is the target,

such transfers would be needed permanently. They further argued that neither convergence nor divergence is taking place within the EU, and that "even if one may argue that near uniform growth is the result of suitably designed policies, however all available evidence points to increasing free trade among EU countries as such a beneficial policy." Instead, the findings suggest that inequality in regional income levels originates from the combination of the differences in total factor productivity, the differences in the employment level, and the differences in the share of agriculture of the regional income.

Recently, Shankar & Shah (2009) have surveyed the literature on the regional inequality and regional development policy of the EU15. The cross-national studies showed that the EU has experienced cross-national convergence. Nevertheless, these studies lacked revealing regional convergence within the countries. This is important, since the major part of national growth could be accounted for by the wealthier or core regions. The cross-regional studies and the individual country level studies, however, gave more mixed and complex results.

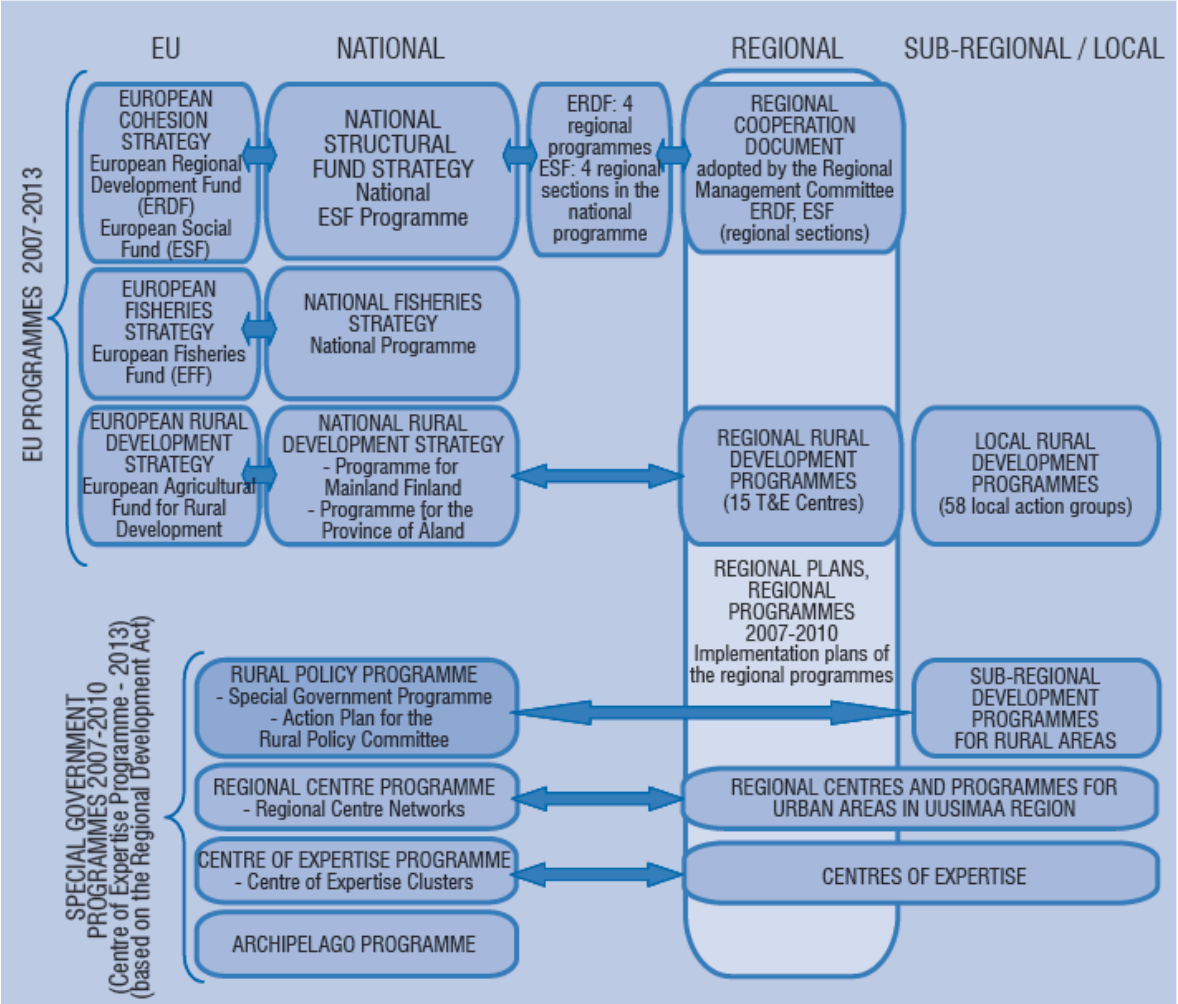
(Shankar & Shah 2009, 37-38) concluded

- *Remove barriers to trade and movement of people, skills and technologies. Let the market work.*
- *Minimize centralized redistribution and subsidies. Transfers to poorer regions can distort market signals.*
- *Where there is a central investment, make sure it is in the appropriate areas. Investment in human capital can increase the incentives for companies to set up businesses in the poorer regions. Certain type of physical infrastructure may do this too. However, investing in physical infra without investing in human capital will only exacerbate the problem- goods will flow from richer to poorer regions and skilled people the other way.*
- *Make sure the regional government takes the lead on regional development and has both the power and the accountability (to its constituents) to do it.*
- *The role of national and supra-national governments should be limited to provide a level playing field.*

These two general overviews by Boldrin and Canova, and Shankar & Shah are examples of the abundant literature concerning the impacts of EU regional policies. One should always be aware of the theoretical and methodological premises behind these studies. Reviews from other theoretic perspectives, for example location theory (e.g. Puga 2002) can provide different perspectives when analysing regional development policies. Further reviews of previous literature are provided in the context of the empirical CGE studies of agricultural, infrastructure and tourism policies in Chapters 6, 7 and 8.

2.2 Rural and regional policies in Finland

Political assistance for Finnish rural areas has combined different tools and measures for carry out rural and regional policies. Common EU policies form the core structure and provide the basic tools and strategies for national and local policies. This chapter gives an overview of the implemented policies and core strategies that have affected rural development and given the basic toolbox for the policy makers during the era of Finnish EU membership. Figure 4 illustrates the main programmes and strategies guiding the Finnish rural and regional policies.



Rural and regional policy framework for the programming period 2007–2013. Source: Ministry of Agriculture and Forestry.

Figure 4. Rural and regional policy framework in Finland.

2.2.1 Rural policy

The general aim of the Finnish rural policy is to recognise the various needs, strengths and opportunities of the rural areas in the different parts of the country. The policy is divided into 'broad' and 'narrow' policy spheres. In this context, a broad rural policy refers to the role and tasks that different sectoral policies have in the rural areas. The main instruments for a broad rural policy are the two parts of the Rural Policy Programme (Maaseutupoliittinen kokonaisohjelma): the Action Programme of the Rural Policy Committee and the Special Rural Policy Programme (the Report of the Government to the Parliament). These two programmes not only guide the broad rural policy but also aim at developing the whole rural policy system. The narrow rural policy, in turn, combines elements from the regional development programmes part-financed by the EU, and the national rural policy which has evolved around the Rural Policy Committee. It contains programmes, measures and instruments particularly oriented towards rural development and policy, including elements of legislation, economic resources, special expertise and official staff (Rural Policy Committee 2004). The most important instrument of the narrow rural policy is the partly EU-funded Rural Development Programme for Mainland Finland.

European Rural Development Strategy for the period 2007-2013

In order to follow the conclusions of the Salzburg conference on rural development (November 2003) and the strategic orientations of the Lisbon and Göteborg European Councils that emphasised economic, environmental, and social elements of sustainability, the following three major objectives of EU rural policy were set for the period 2007-2013:

1) Increasing the competitiveness of the agricultural sector;
2) Enhancing the environment and countryside through support for land management;
3) Enhancing the quality of life in rural areas and promoting diversification of economic activities.

In addition, the Leader Community Initiative was integrated into mainstream rural development programmes. An additional goal was to simplify both the funding and the programming framework. Thus this reform follows and is connected to the reform of the First Pillar of the Common

Agricultural Policy (CAP) in 2003 and 2004, and forms a second pillar of the CAP. (European Commission 2006.)

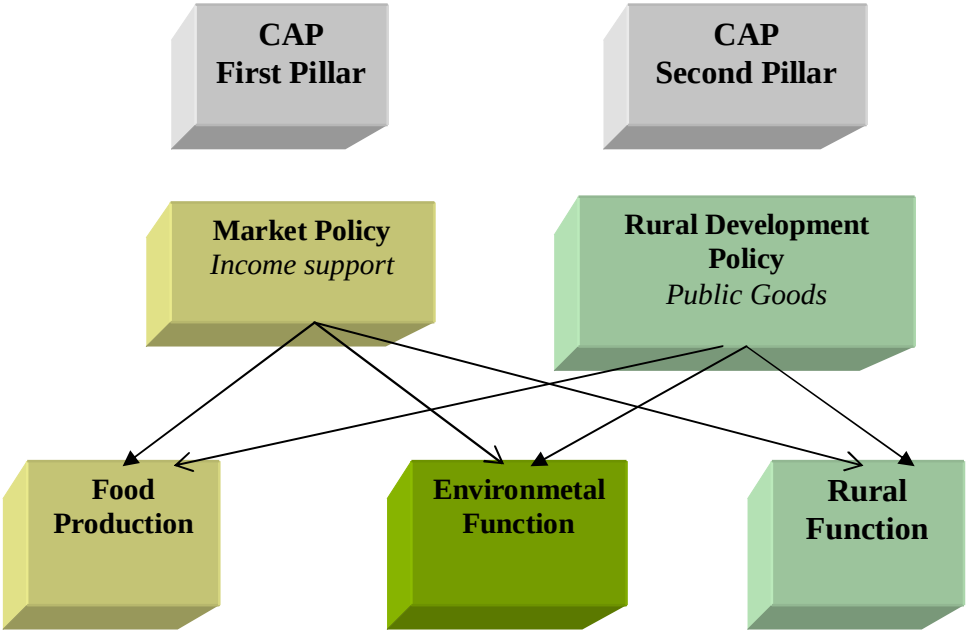


Figure 5. The CAP Pillars (European Commission 2006, 5).

Expenditures under the First Pillar, i.e. direct payments to farmers and measures to regulate agricultural markets, such as intervention and export refunds, are financed by the European Agricultural Guarantee Fund (EAGF), whereas the European Agricultural Fund for Rural Development (EAFRD) finances the rural development programmes of the Member States. (European Commission 2006.)

During the EU programming period 2007-2013, the following programmes are implemented in Finland associated with the European Agricultural Fund for Rural Development (EAFRD): Rural Development Strategy, the Rural Development Programme for Mainland Finland 2007-2013 and the Rural Development Programme for Province of Åland. Total funding allocated to Finland from EAFRD and through so-called modulation (funds taken from direct payments) is approximately 2,100 million EUR during this period.

EU rural policy is built around the four thematic axes for which a range of measures are available. The member states establish, either on the national or on the regional level, their own rural development programmes by choosing the measures that suit the needs of their rural areas best by

taking account of the priorities and strategies chosen in the National Strategy Plans on rural development. (MAF 2007.) Finnish priorities are presented in Table 4 below.

Table 4. Targets and key actions of the Rural Development Strategy and Programme.

	Target	Key Actions
Axis 1	Improving competitiveness of agricultural and rural sectors	• Payments to young farmers • Training programmes for agricultural and forestry producers • Development of food, wood and bioenergy sectors
Axis 2	Improving the environment and the countryside	• Natural handicap payments • Environmental payments • Payments to NATURA 2000 areas
Axis 3	Improving the quality of life in rural areas, and encouraging diversification	• Diversification and development of farm-related economic activities and other rural microenterprises
Axis 4	LEADER approach	• Development of rural tourism, services and villages

The funding for the Rural Development Programme comes from EU funds, from national public and from national private funds. Public funding comprises 86% of the total funding of which EAFRD accounts for 32%. Table 5 shows the allocation of the funding to the different Axes.

Table 5. Funding of the Rural Development Programme for Mainland Finland 2007-2013 (MAF 2009).

	EAFRD, million EUR	Other Public, million EUR	Public, Total	Private, million EUR	TOTAL, million EUR
Axis 1	245.1	299.5	544.6	640.2	1184.8
Axis 2	1538.3	3915.9	5454.2		5454.2
Axis 3	224.5	256.3	480.8	287.7	768.5
Axis 4	111.1	135.8	246.9	123.4	370.3
TOTAL	2119	4607.5	6726.5	1051.3	7777.8

The European Union has specified minimum shares that should be allocated to each of the Axes in the member states. Accordingly, the first Axis should gain at least 10%, the second 25%, the third 10% and the fourth 5% EAFRD funding. Table 6 shows that these limits are only just reached in Finland regarding Axes 3 and 4, while funding allocated to the Axis 2 is notably high (70%). Consequently, Finland is among the EU countries with the smallest share of funding devoted to Axes 3 and 4, i.e. for rural development and countryside, but among the member countries with the

highest share allocated to agri-environmental schemes and natural handicap (LFA) payments (Axis 2).

Table 6. Shares of the different axes of the funding (MAF 2009).

	% Share of Public	%Share of EAFRD	% Share of Private	% Share of TOTAL
Axis 1	8.1	11.6	60.9	15.2
Axis 2	81.1	72.6	0	70.1
Axis 3	7.1	10.6	27.4	9.9
Axis 4	3.7	5.2	11.7	4.8

2.2.2 Regional policy

National and common European regional policies with joint effort enhance the national and regional development targets. The main goal of the Finnish regional policy is a territorially balanced development which grows from local emphases. In particular, the most vulnerable and weak regions are supported. The main tools are the programme-based regional policies and regionally staggered enterprise support measures. (Maaseutupoliittinen erityisohjelma 2007-2010.)

EU Structural Fund Strategy and Structural Fund Programmes

The Structural and Cohesion policies of the EU aim at reducing disparities between regions and social groups, and promote sustainable development and general economic efficiency. During the previous programming periods, the EU financed projects from the Structural Funds, i.e. the European Regional Development Fund (ERDF) and the European Social Fund (ESF), together with the Cohesion Fund, the Financial Fund for Fisheries Guidance (FIFG) and the Guidance Section of the Agriculture Fund. For the period 1994-1999 the following priority objectives were established (EU Commission 1999):

- **Objective 1:** Structural adjustment and development of regions lagging behind.
- **Objective 2:** Converting regions severely affected by industrial decline.
- **Objective 3:** Preventing long-term unemployment and facilitating the integration of young people and persons excluded from the labour market into working life.
- **Objective 4:** Facilitating the adaptation of workers to industrial changes through retraining.
- **Objective 5a:** Speeding up the adjustment of agricultural and fisheries structures.

- **Objective 5b:** Facilitating the structural adjustment and development of rural areas.
- **Objective 6:** Promotion of development in regions with extremely low population density.

Objectives 1, 2, 5b and 6 were spatially restricted. Objective 5a referred to so-called horizontal measures. It was targeted at the agricultural industry including funding instruments for capital investment and grants and loans for farms. In Finland, the most important Objectives were 2, 5a, 5b and Objective 6. In addition, the Leader II Community Initiative implemented locally-oriented projects in rural areas. During the period 2000-2006, the objectives were reduced down to three, and the new objectives were (Armstrong 2004):

- **Objective 1:** Promoting the development and adjustment of regions whose development is lagging behind, including regions whose per capita GDP is under 75% of the EU average, some low density areas in Finland and Sweden, and the most remote regions in the other EU countries.
- **Objective 2:** Supporting the economic and social development of areas facing structural problems, such as areas of industrial decline, rural and urban areas suffering from severe social and economic problems, and the problems of declining fisheries.
- **Objective 3:** Supporting the modernisation of policies and systems of training and employment outside the regions eligible for Objective 1.

In addition, the Leader + Community Initiative followed the previous Leader initiatives.

EU programmes gained their role as the central components of rural policy in Finland during the first two EU Structural Fund programming periods. The main programmes, from the point of view of Finnish rural areas, during the programming period 2000-2006, were Objective 1 and Objective 2, the Regional Rural Development Programme ALMA, the rural Community Initiative LEADER+ and the Horizontal Rural Development Programme 2000-2006.

The OECD (2008a) argues that Finland successfully adapted, completed and combined EU programmes with national funding and managed to increase efficacy and extend coverage by combining different approaches available during the first two EU programming periods. A good example of this is how the LEADER method was implemented by integrating national funds and

EU Structural Funds in order to cover all rural areas in Finland. A corresponding National Rural Programme based on Local Initiative (POMO) was also developed.

For the programming period 2007-2013 the objectives were again redefined, the instruments were cut down to three, and EAGGF Guidance was combined EAGGF Guarantee. The rural development programmes of the member states are now financed from the new EAFRD. The Convergence regions have access to the ERDF, the ESF and the Cohesion Fund, while Regional competitiveness and employment regions have access to the ERDF and the ESF.

Objectives under the European Regional Development Fund

According to the European Union (2008) the overall objective of the ERDF is to help reinforce economic and social cohesion by redressing regional imbalances. This is achieved by supporting the development and structural adjustment of regional economies and declining industrial regions. The fund focuses on financing investments which contribute to the creation of sustainable jobs, on infrastructure investments, and on measures supporting regional and local development. The objectives of the ERDF are

- **Convergence:** Supporting sustainable integrated economic development; the creation of sustainable jobs; modernising and diversifying regional economic structures particularly in R&TD, innovation and entrepreneurship, information society, environment, risk prevention, and tourism; investment in culture, transport, education, health and social infrastructures and energy; and direct assistance for investments in SMEs.
- **Regional competitiveness and employment**
  - i) Innovation and the knowledge economy, including the improvement of regional R&TD and innovation capacities, entrepreneurship, and the creation of new financial instruments for businesses.
  - ii) Environment and risk prevention, including restoring contaminated land, encouraging energy efficiency, promoting the use of clean technology in public transport and formulating plans to anticipate and manage natural and technology-related risks.
  - iii) Access to transport and telecommunications services of general economic interest, especially by improving secondary networks and encouraging access to information and communication technologies (ICT) for SMEs.

- **European territorial cooperation**
  - i) The development of cross-border economic, social and environmental activities through joint strategies for sustainable territorial development, involving encouraging entrepreneurship, protection and management of natural and cultural resources, and the development of collaboration, capacities and the joint use of infrastructures;
  - ii) Establishing and developing transnational cooperation, including bilateral cooperation between maritime regions. The priorities are innovation, the environment, better accessibility and sustainable urban development;
  - iii) Reinforcing the effectiveness of regional policy by encouraging regional and local authorities to form networks and exchange experience.

European Social Fund

The ESF shares the objectives of ERDF, i.e. "Convergence" and "Regional competitiveness and employment". In addition, the promotion of innovative activities and transnational cooperation are within the scope of the ESF. However, the priorities of ESF are different from those defined by the ERDF thus reflecting the particular orientation of the ESF. These priorities are (European Union b):

- Adaptability of workers and enterprises
- Enhancing access to employment
- Reinforcing social inclusion
- Enhancing human capital
- Promoting good governance and partnership, involvement of social partners

National Structural Fund Strategy and Structural Fund Programmes 2007-2013

Since the first official papers of the EU Commission concerning the programming period 2007-2013, it seemed clear that Finland was not eligible for the cohesion target measures. It was also clear that the role of urban areas in regional development would be relatively more important than before. Hence, the Structural Fund Programmes implemented in Finland are based on the objectives: 'Regional competitiveness and employment' and 'European regional co-operation'.

For the first time, the EU has given strategic guidelines (Strategic guidelines for the EU cohesion policy for the period 2007-2013) whereby regional development of the member states is guided following the targets specified in the Lisbon and Gothenburg strategies. The member states are obliged to prepare national strategies which are implemented through the regional operational programmes. During the current period, the entire country of Finland belongs to the Regional competitiveness and employment objective. In addition to the basic funding, eastern and northern Finland receive special funding based on their sparse population.

The operational programmes co-financed by the ERDF have been prepared for the NUTS II areas. Under the Regional competitiveness and employment objective, there are separate operational programmes for Southern, Western, Eastern and Northern Finland. By contrast, the ESF operational programme covers the whole of Mainland Finland (NUTS I). The programme includes a national section and regional sections. (Kuntaliitto 2007)

2.2.3 Regional level

At the regional level, the Regional Plan (Maakuntaohjelma) collects together the regional development strategies and different plans and measures so that the strategies and objectives of various EU, national and local level programmes and objectives are combined under this single plan. In South Ostrobothnia, for example, the aim has been to collect different measures and tools so that different sources of finance and development measures would serve and backup the implementation of the regional projects which, in turn, follow the themes specified by the Strategic Regional Scheme (Maakunnan kehittämisstrategia). Cluster and theme programmes aim at further clarifying and allocating the development measures. The most important issues are collected under the specified themes for which the funding is allocated. The first priority axis in Table 7 is linked with the main clusters of South Ostrobothnia, which are Food Cluster, Metal Cluster, Wood Cluster, Construction Cluster and Welfare Cluster. (Regional Council of South Ostrobothnia 2006.)

The second column in Table 7 lists the priority axes of the Regional Plan of North Karelia for the period 2007-2010. These development axes are not separate, but are interconnected. The Regional Plan places the emphasis on the operational environment and selected production focuses. More precisely, the first focus is based on education and know how, infrastructure, competitive services, good environment and internationality. The production focuses are divided into Core businesses

(Todelliset tuohentuojat) and Future possibilities (Toivonkipinät). Core businesses refer to strong regional industries: plastic and metal, forestry and wood, stone and food sectors. Future possibilities include services such as tourism, welfare services, culture and arts and ICT. The common features for all are entrepreneurship, internationality, sustainable development, cooperation, partnership, new technologies and R&D (research and development). These focuses have their roots in local education, the cultural environment, infrastructure and services. The Regional Council of North Karelia has pointed out that new innovations often grow on the interfaces of different clusters by means of cooperation. (Regional Council of North Karelia 2006.)

Table 7. Regional priorities (Regional Council of South Ostrobotnia 2006; Regional Council of North Karelia 2006).

South Ostrobothnia	North Karelia
Promotion of business • creating new enterprises • development of technology and business skills • growth and internationalisation	Business and entrepreneurship • part of global development
Promotion of innovations and networking and strengthening knowledge structures • promotion of employment and securing work force supply • vocational training, international university cooperation • providing an internationally attractive innovation environment	Know how, education and employment • skills and know-how create success
Development of residential environment and welfare • Competitive regional centre areas and viable countryside • high quality and well operating basic services, work enhancing • clean and diverse environment • culture and recreational services' networks	Welfare, services and leisure • quality for everybody
Improvements of infrastructure • improvement of accessibility to the region • information networks	Regional structure, infrastructure and environment • attractive frameworks

Regional Rural Development Programmes

The Regional Rural Development Programmes for South Ostrobothnia and North Karelia take account of the rural strategies of the European Union, of Finland and South Ostrobothnia, the

contents of the Rural Development Programme for Mainland Finland as well as the guidelines provided by the Ministry of Agriculture and Forestry. The Centres for Economic Development, Transport and the Environment pull together these programmes in close co-operation with numerous local public and private actors.

The strategic focuses of the Regional Rural Development Programmes for South Ostrobothnia for the period 2007-2013 are

1. Strengthening rural entrepreneurship and creation of new enterprises, concerning especially agriculture and forestry, diversified farms, turf and wood energy production, wood products and furniture, construction, the metal industry, machinery and equipment and rural services.
2. Strengthening the interplay between different actors so that existing know-how and skills interact with the new research.
3. Transportation connections and information networks in rural areas.
4. High quality welfare services should be available for all regardless of one's dwelling place.

The objective of the Regional Rural Development Programme for North Karelia for the period 2007-2013 is to strengthen rural vitality and rural business and entrepreneurship.
The strategic focuses are

1) Enhancing the sustainable use of natural resources
2) Strengthening know-how and skills
3) Strengthening innovation activities
4) Specialisation in local strengths and local business strengths

To conclude, the thesis picks specific elements of the presented rural and regional policies. Since experimenting with all the policies and all the emphasised industries would be impossible, the focus is on the following local strategies: the promotion of innovation and know-how, infrastructures, services and tourism, entrepreneurship, business skills, marketing networks and farm diversification. These elements are present at all the policy levels, from the upper EU level to the lower regional level. The chosen industries not only reflect the rural and regional development focuses, but also aim at considering the regional development from the point of view of the primary sector (agriculture) and services (tourism) and in addition through infrastructure improvement that affects all the local industries and institutions.

3 Regional economics

This chapter offers a general overview of the main theories that underlie the regional economics. In addition, the most important terms and definitions related to regional economic development are provided. According to Fujita & Krugman (2004), regional models, urban system models and international models are the main categories of models used in analysing the spatial economy. In terms of theories, urban economics, location theory, and international trade all concern issues where and why economic activity takes place.

Due to the chosen modelling approaches, the theories of international trade and urban economics are reviewed only briefly, whereas location theories and issues concerning agglomeration and dispersion are discussed in more detail, albeit generally. There are also other models not covered in this chapter which discuss particular aspects of industrial clustering, such as the growth pole model (Perroux 1950; Schumpeter 1934), the incubator model (Chinitz 1961), the product cycle model (Vernon 1966), the Porter model (1990,1998) and new industrial organization models (Williamson 1996). It is worth pointing out that the models used in the empirical parts of this thesis are not spatial models in the traditional sense, since a particular 'distance variable' is not included in the multiplier or in the general equilibrium models. However, CGE theory is a special type of the general theory of location and space economy (Isard 1956, 53). The general equilibrium theory is presented in connection with the empirical model in Chapter 5.

3.1 Focal concepts

The core concepts important not only for this thesis but also for regional economic development are first introduced before going further into the theories. According to Mulligan (1984), the term agglomeration refers to the concentrations or clusters that appear in terms of geographic levels. Mulligan argues that there are two major reasons behind economic agglomeration. Firstly, production tends to cluster spatially in order to attain a comparative advantage which may arise, for example, in material sites, terminals, transhipment points, peak value intersections, and cheap labour pockets. Correspondingly, people are willing to live in centres and cities in order to avoid excessive transportation costs. Secondly, the process of clustering itself generates advantages to consumers and producers since the production clusters create cost reductions through internal

(scale) or external (localisation, urbanisation) economies. In addition, consumers gain additional utility due to the public goods available in centres.

Alfred Marshall (1922) was the first to provide a detailed description of the sources of agglomeration economies. These sources are i) knowledge spillovers, ii) the advantages of thick markets for special skills, and iii) backward and forward linkages associated with large local markets. According to McCann (2001), Marshall's schema interprets these sources as being external economies, in that they accrue to all of the firms located in a certain area. Mulligan (1984) defines internal and external economies as follows: *"Internal economies usually refer to the (per unit) production savings enjoyed by a firm when it utilizes plant and equipment at a large scale. External economies refer to savings derived from a firm's particular locational association with a spatial clustering of economic activities."*

Table 8 shows Fujita & Krugman's (2004) division of the forces that create and accelerate agglomeration and dispersion.

Table 8. Forces affecting geographical concentration and dispersion.

Centripetal forces	Centrifugal forces
Linkages	Immobile factors
Thick markets	Land rent and commuting
Knowledge spillovers and other pure external economies	Congestion and other pure diseconomies

The circular causation of the forward linkages (incentive for workers to be close to the producers of consumer goods) and the backward linkages (incentive for producers to concentrate where the market is larger) generate the centripetal force. Presuming that these linkages are able to overcome the centrifugal force that is generated by immobile factors, all the manufacturing will be concentrated in one region. This kind of core-periphery pattern tends to occur when (i) the transport cost of the manufactures is low enough , (ii) varieties are sufficiently differentiated, or (iii) the expenditure on manufactures is large enough. (Fujita & Krugman 2004.)

Economy of scale is another source of agglomeration. Marshall (1922) distinguishes three sources of increasing returns to scale that tend to occur when firms are located in clusters. *Information spillovers* refer to the connections that employees have with other firms' employees. Such intercourse enables the sharing of tacit information. This information is shared on a non-market basis and concerns issues such as new products, personnel, technology, and market trends. *Non traded local inputs* refer to the ability of a group of firms to acquire expensive specialist services or equipment. *Local skilled-labour pool* allows firms to reduce their labour acquisition costs because a sufficient amount of labour is available in varying market demand conditions. The key characteristic of these sources of agglomeration is that spatial clustering reduces the information transaction costs. (McCann 2001.)

Moreover, Ohlin (1933) classifies the economies of agglomeration first into *the internal returns to scale*. Such gains are attained due to the size of an individual firm. Second comes *the economies of location*, which benefit a group of firms sharing the common line of business and geographic location. Finally, *the economics of urbanization* that refers to the economies of agglomeration benefiting firms across different industries.

3.2 Theories of regional economics

Trade theories

Ricardian trade theory (1817) concerns the absolute advantage, relative advantage and comparative advantage of production between countries (regions). The fact that trade is based on comparative advantage rather than absolute advantage is generally accepted. Yet, it is controversial whether the Ricardian theory can offer a convincing explanation for the reasons for comparative advantage. In the Ricardian model, varying labour productivity is in the background of comparative advantage. The variations, in turn, can be traced back to the differences in regional technology and wages. (Armstrong & Taylor 1993.)

The Heckscher-Ohlin international trade theory introduces enlargements in the factor proportions such that, in addition to labour, also capital and the initial capital endowment affect the comparative advantage of each region. In brief, a region endowed with excessive labour will specialise in labour

intensive commodities (relative to capital). The determination whether labour or the capital intensive industry has the relative advantage is based on the comparisons of the price relations between the factor prices and the product prices. Later on, the additional production factors: natural resources and human capital, i.e. skills were included in the Heckscher-Ohlin theorem. For example, wage differences between the high and low skilled labour groups characterise skill intensive industries. One drawback of the theorem is that it assumes zero factor mobility between regions. This rigidity cannot be relaxed since the basic cause of the comparative advantage is local labour or capital abundance. (Heckscher & Ohlin 1993.)

Location theory

The industrial location theory addresses three core questions. Firstly, what determines the level and the type of capital invested in a particular region? Secondly, why are the particular firms located there and thirdly, why does the area gain certain levels and types of investments. There are three models that provide explanations for, and the consequences of the industrial location behaviour, namely the Weber model, the Moses model and the Hotelling model. These models provide tools to analyse how transport costs, local factor prices, production and substitution possibilities, market structure, competition, and information affect the location decisions of firms. These models, however, are unable to draw conclusions whether optimal location behaviour induces industrial clustering or industrial dispersion. (McCann 2001.)

The Weber model (1909) is a classical theory of the location of production. It adapts the standard microeconomic assumption of a profit maximising firm. In this model, the profit maximisation and location has a connection so that, assuming a fixed price per unit of output, the optimal location is there where the total input plus output transport costs are minimised, *ceteris paribus*. The Weber model, however, does not take account of the relationship between input substitution and location behaviour. Moses (1958) was the first who included substitution behaviour coherently in the Weber analysis so that the input substitution changes the relative transport costs and thus the optimal location of the firm. Moses' model also took account of the effects of returns to scale on the firm location. McCann (2001) interprets Moses' model results as a spatial equivalent of the firm in perfect competition. Hotelling (1929) introduced monopoly power into the location models. The Hotelling model predicted that firms will cluster in space for reasons of spatial competition only if price competition is ruled out.

Another important developer of location theories is Walter Isard (1956; 1975) whose main contribution in this field was the reformulation of the location problem as a standard problem of substitution. In other words, firms are trading off transportation costs against production costs just like they make any other cost minimising or profit maximisation decision. Isard combined the aggregative analysis of the Thünen School with the Weber school, which is primarily concerned with the locational problem of an individual firm producing a given product. According to Isard (1956), the Thünen tradition assigns an infinite immobility for a producer, and therefore ignores the problems of location for a individual producer. This approach concentrates on the distribution of agricultural production over a given region.

Isard begins with the previously defined (e.g. Weber) categories of commodities that are classified according to mobility, dispensability, geographic occurrence, and weight loss for example, *Indispensable, single-source, immobile commodities* and *Dispensable, many-source, mobile commodities*. He argues that these different categories can be expressed in terms of series of relations which involve substitution. Isard defines three types of substitution possibilities: (a) substitution between transport inputs and various revenues associated with the use of different combinations of commodities in the production process, (b) substitution among the different sources of any one commodity, (c) substitution associated with the different locations where a commodity can be transported. In addition, Isard highlights the importance of weight loss during transportation.

Further, Isard introduces different orientations of location equilibrium. The first is a transport-oriented equilibrium and the second is a labour-oriented equilibrium. The latter introduces differentials in factor costs and revenue potentials. In the model, a transport input represents a movement of a unit weight over a unit distance. Even though the assumptions of uniform costs over space is relaxed, and labour costs can vary from one location to the other since different sites have different access to labour reserves, the true substitution between transport inputs and labour inputs cannot be presented. The reason is that the inputs are measured in different units: labour in man hours and transport in ton-miles. Nevertheless, the main idea is that if location of both low labour and low transportation costs is unavailable, production is located in an area where labour costs are low. Consequently, more transport inputs are consumed and, simultaneously, transport outlays increase while the labour input is kept constant. However, labour outlays decrease due to low wages. Thus the substitution occurs between labour outlays and transport outlays (Richardson 1972).

In addition, Isard (1956) introduced a combination of agglomeration analysis and agricultural location theory based on von Thünen-type and Weber-type traditions. The starting point is Ohlin's classification of agglomeration, i.e. large-scale economies, localisation economies and urbanisation economies. Isard aims at integrating substitution analysis with traditional production theory. Isard argues, bearing in mind that rent differentials are at the core of agricultural location theory, that differences in the price of land services associated with different spatial locations are a major location influence. Concerning agricultural enterprise, the rent differential corresponds to the labour cost differential of a labour intensive industry as described above. Therefore, with agricultural enterprise, it is essential to investigate the substitution relation between rent outlays and transport outlays.

Isard (1975) also combined input-output analysis with the location analysis. Concerning regional analysis, Isard focused on employment and income since economic factors play a central role in the determination of not only the production of goods and services, but also the social and political statuses of people. He built input-output tables in order to consider both the direct and indirect effects of economic changes. He argued that it is of utmost important to gain knowledge about the interdependencies of economic activities in order to further develop the theory of location economy.

Central place theory

Central place theory aims at explaining the functional and locational characteristics of marketing centres. More precisely, it concentrates on how (i) tertiary (i.e. trade and service) activities are allocated among centres and how (ii) central places are distributed over the landscape. The foundations for this theory are based on the findings of Christaller (1966) and Lösch (1954). In brief, different locations have different levels of centrality and in addition, goods and services are efficiently provided on a hierarchical basis. The relative centrality of the location of each centre determines the type and variety of goods a particular centre produces. The theory emphasises the role of these centres as providers of goods and services to the surrounding population (both rural and urban). Central place theory also emphasises the distinction between export-oriented activities and locally-oriented activities. (Mulligan 1984.)

The Christaller (1933) model of central places showed that a hierarchical urban system can automatically exist with a variety of different-sized spatial market areas. Lösch (1940) also

significantly contributed to central-place theory. A Löschian approach can be understood as a microeconomic approach to the urban system in that a competitive outcome will automatically lead to the most efficient spatial allocation of activities. (McCann 2001.)

Later, New Economic Geography models (Krugman 1991; Krugman 1995; Fujita et al. 1999) combined monopolistic competition into the Christaller-type approach. The core elements of these models are i) productivity of manufacturing, ii) transportation costs of products, iii) and welfare effects associated with product variety. The models assume that the production is split into agriculture and manufacturing. Manufacturing produces several outputs under monopolistically competitive conditions, while agriculture produces a homogenous product under perfect competition. However, according to Fujita and Krugman (2004), location analysis should explain both concentration and dispersion. Even if the von Thünen tradition explained the pattern of land use, it could not explain why centres are formed. Therefore the goal of New Economic Geography is that, in general equilibrium, it takes into account both the centripetal forces pulling economic activity together and the centrifugal forces pushing it apart.

Urban economy

Urban economy concentrates on aspects of urban land use. The tradition can be traced back to Von Thünen (1826), who built a model of land rent and land (concentrating on agricultural production) so that in equilibrium, goods and factor prices (including land price) are determined simultaneously. The high valued land near centres is reserved for crops with high transportation costs and/or crops yielding high value per acre, whereas the land-intensive or cheaply transported crops are produced further away from the centres. The model determines the forces that spread economic activity away from centres as the centrifugal forces, and correspondingly the forces that create centres by pulling economic activity together are defined as centripetal forces. Urban economics, in turn, determines both the pattern of land use and land rents around the central business district. The urban economy aims at explaining why particular groups of people and industrial activities occupy land at specific locations within the urban economy. This problem can be reduced to the determination of an equilibrium bid-rent curve as a function of distance of households or firms from the city centre. (McCann 2001.)

4 Bi-regional Social Accounting Matrices and Multiplier Analyses for the regions of South Ostrobothnia and North Karelia

According to McCann (2001, 139) there are three main approaches to regional multiplier analysis, namely the economic base model, Keynesian regional income multipliers, and input-output analysis. The economic base model divides production into two aggregate sector groups. The first group is the 'basic sector' that comprises basic industries and export-base industries and is characterised by a dependence on the economic conditions external to the local economy. The second group, the 'non-basic sector' includes retailing and services that are dependent on the local demand. Briefly, the external income stimulates the non-basic sector by spending on the local services and goods and by employing local labour and capital factors. Hence, the non-basic sector is dependent on extraregional demand. The second approach, the Keynesian regional income multiplier model, is based on the standard Keynesian national income-expenditure multiplier model. The model assumes constant marginal and average input costs combined with non existing capacity constraints. In order to find out overall economic impacts following a particular change in any individual component of aggregate demand, the change is multiplied by the multiplier value. This operation aims at revealing the impacts of all the successive rounds of expenditure.

These two approaches, however, lack the sectoral details that input-output models are able to provide. Input–output models can not only predict the changes in the output of sectors, but can also trace back the linkages between the different sectors. Backward linkages refer to the input demand of industries, and correspondingly, forward linkages refer to the supply of inputs or the intermediate products to other industries (Hirschmann 1958). Hence, the number and direction of these linkages can show the ability of a certain industry to create economic activity in a specific region.

4.1 The Input-Output model and the Social Accounting Matrix

The technology used in input-output modelling is known as the Leontief model. The basic assumption is that sectoral production is completely demand-driven. Thus the model assumes that there is excess production capacity, and that increasing demand can always be met by higher output without price increases. The model assumes constant returns to scale and that supply of factor inputs is perfectly elastic. (for example Armstong and Taylor 1993; Sadoulet & de Janvry 1995.)

The number of backward linkages of a certain industry can be represented with the Leontief inverse matrix. The column sums of the Leontief matrix are called production multipliers showing how much production is needed in the whole of the economy in order to produce one unit of output at a particular sector.

Simon & Blume (1994) depict the input-output model as follows

$$Ax = b$$

$$x = A^{-1}b$$

$$x_i = a_{i1}x_1 + a_{i2}x_2 + \cdots + a_{in}x_n + c \qquad (1)$$

where

x_i = gross output

a_{ij} = the amount of product *i* needed to produce one unit of good *j*

c_i = consumer demand for product i

matrix b contains the parameters from the right-hand side of the system

The $(i,j)^{th}$ entry a_{ij} of technology matrix A indicates how many EUR millions of good *i* are needed to produce EUR 1 million of good *j*. The sum of the entries in each column of *A* gives the total cost of producing EUR 1 million of the product that column represents. Since each industry is expected to make a positive profit, the sum of the entries in each column should be less than 1. This character is one of the conditions that guarantee that *I-A* has a nonnegative inverse.

The important advantage of I-O models is their internal consistency, indicating that all the effects of any given change in final demand included in the model are taken into account. However, one disadvantage of an open I-O model is that it focuses solely on the commodity flows. In order to overcome this limitation, the regional input-output tables can be expanded by building social accounting matrices of the regions. In addition to the production sphere of the economy, social accounting matrices provide information on the flows of income to and from household accounts and capital accounts, and at the same time, connect the regional economy to the rest of the country and to the rest of the world. Typically, peripheral rural areas are dependent on transfers from more prosperous regions channelled through the central government or extra regional or foreign investments (e.g. Dow 1986). North Karelia and South Ostrobothnia are no exceptions to this rule.

According to Pyatt and Round (1985), a Social Accounting Matrix represents macroeconomic and mesoeconomic accounts of a socioeconomic system by capturing the transactions and transfers between the economic agents included in that particular system. A SAM aims at recording and portraying all the economic activities, such as consumption, production, accumulation, and distribution taking place during an accounting period. The particular strength of a SAM is its capability to capture the complex linkages among institutions, production and the rest of the world. It can be considered a relatively flexible and comprehensive accounting framework for policy and planning simulations. In this accounting framework, the included accounts are represented as a square matrix in which incomes and expenditures are shown as corresponding rows and columns of the matrix thus displaying the circular flows of income in the regions. In particular, it records the interactions between institutions and production activities through both factor and product markets. (Round 2003.)

There are several good qualities related to SAMs. Firstly, a SAM is able to display a large amount of information in a simple and illuminating way. Simultaneously, it reveals the linkages between income distribution and the economic structure of the system and, in addition, it brings together data from different, often disparate, sources which together can describe the structural characteristics of an economy. Finally, a SAM provides an analytical framework for modelling in that it provides direct input data for a range of models, for example fixed-price multiplier models and computable general equilibrium models. (Pyatt 1988.)

Since the 1970s, SAMs have been increasingly constructed particularly for the purposes of developing country research (for example Pyatt & Thorbecke 1976; Hayden & Round 1982). At the moment, country-level SAMs are widely used. By contrast, due to a high data requirement, regional, and particularly bi-regional SAMs, are not as common. However, for example, Round (1985) constructed a bi-regional SAM for analysing the relationship between East and West Malaysia, Roberts (1998) built a SAM in order to consider the spatial diffusion of rural-urban spillovers in Grampian, Scotland, and Balamou and Psaltopoulos (2006) a SAM analysing rural-urban interdependencies and their diffusion patterns in southern Greece. In Finland, regional-level SAMs have been constructed by, for example, Kola and Nokkala (1999), Marttila (2007) and Törmä for his RegFin CGE model (e.g. Törmä 2006). All of these studies are based on the Statistics Finland's regional input-output tables for 1995 or 2002.

4.1.1 Data collection and SAM construction process

Statistics Finland's regional input-output tables, relating to 2002 were used as a core information in building the SAMs for North Karelia and South Ostrobothnia. These tables also served as control totals for disaggregated accounts. The disaggregation was based on information collected from several secondary data sources. In addition, remaining gaps were filled with the household survey and firm interview findings completed during the EU's 6th Framework Territorial Aspects of Enterprise Development in Remote Rural Areas (TERA) project. Regional input-output tables include, among other things, symmetrical supply and use tables. The use tables provide intermediate input demands between production sectors, industry specific value added, gross operating surplus, net taxes, total of wages and salaries, exports, gross capital formation, and private and public consumption totals. The supply or "make" tables provide information on local supply and imports by product groups. These tables concern the whole NUTS3 regions.

According to Statistics Finland (2006), most of the data used in compiling regional I-O tables were obtained from registers, other databases and the data files of basic statistics. The most important sources have been regional accounts, national accounts (especially their supply and use tables), statistics on industrial structure and products, structural statistics on service industries, statistics on foreign trade, the register of enterprises and establishments, corporate taxation reports, statistical databases of central and local governments, statistics on agriculture and forestry, and the Household Budget Survey. The SAM tables comply with the concepts and definitions of the European System of Accounts (ESA95) and with the UN System of National Accounts 1993. The industrial classification used in the SAM is based on the national standard industrial classification TOL2002. The product classification follows the activity-based product classification CPA of the European Union (Statistics Finland 2007).

Additional information sources were also used in order to be able to complete the division between urban and rural areas. Some of them overlap with the sources for the I-O tables. However, more precise information at the municipality level was needed and used. This kind of information was attained, for example, from the regional statistics source of Statistics Finland (ALTIKA), databases of local public and private actors, and information provided by the tax authorities. Compared to the regional I-O- tables, SAMs are much more detailed as far as factors of production, households,

government accounts, Rest of the World and Savings Investments accounts are concerned. All the core information relates to the calendar year 2002.

Regardless of the availability of high quality and relatively extensive secondary data in Finland, primary data was also collected for SAM construction in order to fill the still remaining information gaps. Accordingly, both the business and the household surveys were carried out during autumn 2006. Information was collected from both the rural study areas of North Karelia and South Ostrobothnia as well as from the urban study areas of Joensuu and Seinäjoki. The business sample consisted of 163 urban and 155 rural enterprises. An introductory letter was posted to each of the firms, and afterwards interviewers called and set up face to face interviews. In summary, 48 face-to-face interviews were completed in the urban area of Joensuu, and 80 face-to-face interviews in the rural area of North Karelia. In South Ostrobothnia, 51 face-to-face interviews were completed, 20 of them from the urban area and 31 from the rural area. The difference in the numbers between the two regions is because North Karelia was an EU project study area, and in addition to two student interviewers from the University of Helsinki, two persons from Pro Agria Pohjois-Karjala interviewed firms and completed all the interviews in the rural area of North Karelia.

The household sample size was 1,250 for both of the regions including both rural and urban households. The Finnish Population Register Centre randomly picked the households, and questionnaires were sent to the oldest person of the household. In the end, of the questionnaires received, 234 were complete enough to be included in the final analysis. However, the fact that two adults in each household were asked to answer a part of the questionnaire, increases the amount of information attained. Of the questionnaires returned from South Ostrobothnia 219 were complete enough to be used. Since the major part of the information of the above described superior data was collected for the NEG models in the TERA project and other research purposes, and only a minor part was utilised in this research, the more detailed description of the surveys completed in North Karelia can be found from the EU 6th Framework programme project Territorial aspects of enterprise development in remote rural areas deliverable No. 6 (Rouvali & Psaltopoulos 2006).

At the first stage, the information from the regional input-output tables was arranged into the SAM tables. However, certain modifications were made in order to attain a uniform valuation structure of transactions. In the regional input-output tables, consumption expenditures, exports and gross capital formation are valued as basic prices, and taxes related to these segments of demand are allocated under institution accounts as lump sums. Therefore, the total indirect tax amount was

distributed to the distinguished groups of commodities. In practice, the commodity specific tax amount was counted by using a coefficient of indirect taxes such that the equation (*1+ indirect taxes / consumption expenditures at basic price*) produced the value. Value 1.22 (hinnoitteluperusteen korjauskerroin 2001) was used throughout the commodities, since this research do not aim at simulating changes in value added taxes. In Finland, concerning most of the commodities and services, the value added tax rate was 22% (in 2002), exceptions were food and fodder supplies (17% in 2002, which was reduced to 12% in 2009), e.g. pharmaceuticals, books, accommodation services and passenger transport and hairdresser services 8%. Finally, commodity-related taxes were added under the commodities columns in the SAM in order to value supply at the purchaser's prices.

Subsequently, the regional input-output tables were used as control totals, when the accounts were distributed to rural and urban accounts. Information from other secondary sources described above and information from surveys was included in the tables. Finally, the SAMs were balanced by using a cross entropy method. The program was run by using GAMS software. This program corrects imbalances in the data by minimising the entropy distance of the cells of the estimated SAM subject to the constraint that row and column totals should be equal (Robinson et al. 2000).

4.1.2 SAM tables

The general structure of a rural-urban SAM is shown in Table 9 on page 44. More detailed description of the accounts is provided in the next chapter, the list of the SAM accounts in Appendix 7, and the full bi-regional SAMs in Appendix 1**.** In this research, the general structure of the SAM aims at capturing the rural-urban linkages of the regions.

All the accounts are ordered as a square matrix, such that the receipts and expenditures for each account are shown in the corresponding rows and columns of the matrix. A SAM follows the principle of double-entry accounting such that for each account, the total revenues equal the total expenditures. The virtue of a SAM its flexibility that allows one to build an appropriate structure and disaggregation level focused on the needs of a particular research problem. For example, reading down the first column, the production sectors are separated into rural and urban activities. Intermediate input demands between production sectors are presented where commodities rows

cross the activities columns. At this point, fixed input-output coefficients (Leontief matrix) are contained within the SAM.

Next, the value added of production is presented. The total value added was collected under the 'operating surplus' accounts in the input-output tables. In the SAMs, several rural and urban factor income accounts are distinguished. The production and product-related taxes and industry subsidies are presented at the crossing of the government row and the activities column such that the taxes enter as positive entries and subsidies as negative entries. Finally, rural and urban gross inputs are presented at basic prices. Similarly, reading along the households' rows, the distribution of factor incomes across different household groups are followed by government income support transfers and factor incomes from the rest of the world. The total sum of a household row refers to the incomes of a particular household group.

Table 9. The basic structure of the rural-urban SAM.

	Activities		**Commodities**	**Factors**		**Firms**		**Households**					
	Rural	Urban	Commodities	Rural	Urban	Rural	Urban	Rural	Urban	Government	ROW	S-I	Total
Rural activities Urban activities			Marketed output										Gross output
Commodities	Intermediate inputs							Consumption expenditures		Government consumption	Exports	Gross capital formation + change in stocks	Demand
Rural factors Urban factors	Value added												Factor income
Rural firms Urban firms													Firm income
Rural HHs Urban HHs				Factor income		‘Capital transfers’		Inter-household transfers		Transfers to households	Factor income from ROW		Household income
Government	Net production and product taxes		Sales taxes	Factor taxes		Income taxes		Income taxes			Transfers from ROW		Government income
Rest of the World			Imports	Factor income to ROW						Transfers to ROW			Foreign exchange outflow
Savings-Investments						Savings		Savings		Savings	Foreign savings		Savings
Total	Rural gross input	Urban gross input	Supply	Factor expenditures		Firm expenditures		Household expenditures		Government expenditures	Foreign exchange inflow	Investments	

4.1.3 Social Accounting Matrix details

Activities

The bi-regional SAMs consist of separate entries for the rural and the urban activities. The North Karelia SAM has 28 accounts for the rural and 23 accounts for the urban activities. Similarly, the South Ostrobothnia SAM has 28 rural and 25 urban activity accounts. Rural and urban industries share the same technologies, indicating that the division between labour and capital is supposed to be similar in the urban and the rural areas in each particular industry. However, among the industries the shares vary. The division between rural and urban industries is based on the statistics of the enterprise location by industries and regions, and on information on workplaces by industries and municipalities. Industries are divided into rural and urban according to the shares of the employers in each industry and location. In addition, the number of firms in each area was checked. The employment statistics used are annual statistics providing regional data on the economic activity and employment of the population of a specific region. The population of the statistics refer to the permanent residents of Finland on the last day of the year. The data is mainly derived from administrative registers and statistical data files. The list of the statistics used is in the refence list of this thesis.

Commodities

The commodities accounts are not spatially disaggregated. There are both theoretic and practical bases for this decision. Firstly, commodity markets can be considered highly integrated inside provinces. From a practical point of view, it would have been very difficult to collect accurate information on the origins of commodities and the purchasing habits of consumers. For example, rural people shop in the urban areas and similarly, urban people use commodities and services produced in rural areas. Technically, in the SAMs each industry produces a single commodity that is an aggregate of the products and services produced by this industry. Altogether, there are 27 accounts for commodities and services in the SAMs.

Factors

The North Karelia and South Ostrobothnia SAMs include ten different factor accounts. The accounts are spatially distinguished according to rural/urban industry shares. The labour factor division is two-fold such that, in the beginning, accounts for rural white collar and rural blue collar workers and urban white collar and urban blue collar workers were distinguished. Correspondingly,

the capital accounts are distributed into rural capital, urban capital and agricultural capital. Agricultural land factor is separated and finally, accounts for rural housing rent and urban housing rent are distinguished.

Labour factors

The division of the activities into rural and the urban as described above is used as a starting point for the further division of the labour factor. Wages and salaries of blue collar and white collar employers of the secondary sectors were drawn from the "Regional and industrial statistics on manufacturing" and the "Persons working in the area" statistics (Statistics Finland). A combination of these two sources forms the basis for the labour classification in the SAMs. Information attained from other sources was compared to the regional input-output tables. The input-output table totals were used as the control totals.

The division into blue and white collar labour among public sector employees was based on the education information provided by public sector employers. Employees are classified as white collar if they have completed tertiary education and blue collar if they have completed primary or secondary education. Before the total sum of the compensation of employees (which was reported in the input-output tables) is distributed to the household groups, the employers' and employees' shares of pensions and social security payments and the share of the rest of the world is deducted and allocated to the government and rest of the world accounts.

Information on the shares of the social security payments was attained from the regional and industrial statistics on manufacturing. In total, these payments comprise approximately 25% of the total sum of wages and salaries. Since, at this point, rural activities employ only rural workers and urban activities only urban workers, the wages are further allocated taking account of both rural and urban commuters i.e. people living in the rural area and working in the urban area, and vice versa.

Capital factors

The total of 'gross operating surplus by industry' provided by the input-output tables was divided into SAM capital factor accounts. In the SAM, activity accounts pay these capital factor incomes to the local firms, households and to the rest of the world (ROW) accounts. In order to find a value for agricultural land, the farm acreages of North Karelia and South Ostrobothnia were multiplied with the yearly average rents of agricultural land. According to Myyrä (2004), the average rent for agricultural land in 2003 in North Karelia was 105€/ha, and 171€/ha for South Ostrobothnia. The

major part of factor incomes accrued from “Agricultural capital” and “Agricultural land” were paid to the Agricultural households, and a smaller share to the rural enterprises.

Rural and urban housing land income is based on the Statistics Finland’s calculations on the operation surplus that is allocated to the “industries’ real estate and renting” classification code is K7021 (TOL). The purpose of this capital factor is to be able to follow how policy and economic changes effect on housing prices. The shares allocated to rural and urban housing are based on the following figures where the total area of dwellings as well as average rents are presented.

Table 10. Housing areas and average housing rents in rural and urban areas in 2002 (Statistics Finland).

	m^2	EUR / m^2	Total EUR	%
South Ostrobothnia	9 364 848			
Rural	7 675 663	6.30	48 356 677	79.6
Urban	1 689 185	7.35	12 415 510	20.4
North Karelia	5 988 346			
Rural	4 025 689	6.77	27 253 915	64.9
Urban	1 962 657	7.51	14 739 554	35.1

The remnants of the operating surplus of the input-output tables form the rural and urban capital factor accounts. Capital and land factor incomes are paid and allocated first to rural and urban enterprises and then distributed to the different household groups by using information on how much and what sort of income different socioeconomic groups earned in North Karelia and South Ostrobothnia in 2002, and further, how much of the capital income and wages urban and rural households had earned. This information was collected and counted from statistics of “natural persons’ income in regions and municipalities” in 2002. In the SAMs, rural activities pay factor incomes both to the rural and to the urban firms and households and similarly, urban activities pay factor incomes to both rural and urban firms and households. Self employment income is included within the capital income accounts.

Households

There are six different household groups in the SAMs and in addition a tourist household account and a non-profit organisations serving household (NPISH) account. Numbers and shares of the individual groups are presented in Table 9 below. These shares are based on the statistics of the main types of peoples’ activities, the population data grouped by socioeconomic status, agricultural

statistics, population statistics and residence statistics. In addition, information on the average household sizes in different regions and areas of Statistics Finland was utilised, and also information that was collected in the household surveys. In the SAMs, both income and expenditures are reported. Since several different sources of information were used, it was necessary to find the right balance between them in order to find realistic income and consumption structures for each household type in each area. In different parts of Finland, household groups are different, for example, in terms of average income, consumption expenditures and structures and the size of the household. Table 11 shows the different types, numbers and the percentage shares of the household groups.

Table 11. The household groups.

	North Karelia		South Ostrobothnia	
	N:o	%	N:o	%
Rural Agricultural HHs	3100	4.2	8300	10.2
Rural Working HHs	16967	35.4	19817	24.3
Rural Other HHs	25813	23.2	32494	39.9
Rural Commuter HHs	3760	5.2	4377	5.4
Urban Working HHs	11914	16.8	8894	10.9
Urban Other HHs	11446	15.2	7577	9.3
Total	**73000**		**81459**	
Rural share	49640	68	64988	80
Working HHs	36091	49	41388	50.8

Rural agricultural households earn capital income directly from the activity "Agriculture". This part of the capital income is not circulated through the rural enterprise account because of a need to build and preserve a clear connection with agriculture, agricultural subsidies and agricultural households. However, agricultural households also earn wages and capital incomes from other activities than agriculture. The shares of the different income sources is based on the information on "statistics on income structure of farms" in that around 40% of agricultural households' incomes comes from wages, salaries and capital incomes from other industries than agriculture, and from income transfers from the government. (TIKE 2004.)

Rural working households consist of all the working households, i.e. both blue and white collar households as well as entrepreneur households of the rural area. However, agricultural and commuter households have their own accounts. This group earns its income from wages and salaries, capital income and income transfers.

Rural other households include the rural pensioner, student and unemployed households that earn their income from income transfers and from capital income.
Representative tourist households' consumption structure was derived from "Finnish Tourist Satellite Accounting" figures from the national level. Technically, tourist households' income comes from the rest of the world accounts.
Rural commuting households refer to the rural households that have at least one member who is working in the urban areas.

Urban households are classified correspondingly, with the exception that there are no agricultural households in the urban area. In addition, urban commuting households are merged into the urban working household groups. All the household groups have different income and consumption structures. This information has been collected and derived from local, regional and national data and information sources.

Tax accounts
The SAMs distinguish three different types of taxes in the economy.
The Activity tax account contains value added taxes and excise duties paid by industries and in addition, subsidies on products and services received by industries. It also includes, for example, petrol and waste taxes and (indirect, not product-related) subsidies paid to different industries. Accordingly, all the agricultural support is under the activity tax account. Taxes appear as positive entries and subsidies as negative entries so that the total sum of the activity account refers to the net value of taxes and subsidies of each activity.
The Sales tax account collects all the indirect taxes that are included in the purchaser's prices for the commodities and services, i.e. value added tax, petrol tax, tobacco and other commodity taxes.
The Income tax account records direct taxes paid by the households and firms, i.e. taxes on wages and capital income and the taxes on firms' profits.
The Factor tax account collects social security payments, pension contributions and the unemployment insurance contributions: both the shares of employers' and employees'. The total sum was estimated as 25% of the sum of wages and salaries.

Government accounts receive tax incomes, record public consumption, and pay welfare benefits to households and subsidies to industries. Since the incomes of the local governments do not cover all the costs (budget deficit), the local governments receive payment from the Finnish central

government. These payments are shown in the crossing of the government and the rest of the world accounts.

Rest of the World accounts (ROW) include both the rest of the Finland and the other countries. These accounts show all the payments to and from the other regions of Finland, and to other countries. They show not only imports and exports, but also factor payments, income transfers and foreign savings. Foreign savings refer to the current account between the region and the rest of the world (other regions and other countries.)

Savings and investments accounts balance regional investments and savings. Investments are calculated as commodities, not as activity-specific investments, and thus follow the structure of the regional input-output tables. Savings consist of household, firm, and government savings. By financing local investments, foreign savings balance the regional deficits.

4.1.4 Key economic indicators from the Social Accounting Matrices

In order to provide an overview of these regions, including their economic structures and positions, and the differences between rural and urban areas, key economic indicators were drawn from the SAMS. These selected indicators are the gross regional domestic product and the distinction of the most important sectors in terms of value added and employment.

Table 12. Gross regional domestic products in the study areas.

	GRDP, EUR mill	GRDP, EUR/capita
North Karelia Rural	1724.02	14622.76
North Karelia Urban	1207.67	23091.22
North Karelia Total	2931.69	17224.99
South Ostrobothnia Rural	2587.25	16239.14
South Ostrobothnia Urban	837.21	24069.59
South Ostrobothnia Total	3424.46	17642.33

Table 12 illustrates the differences between the rural and urban areas in both of the regions in terms of GRDP. In the urban area of Joensuu (in North Karelia), the urban gross regional domestic product per capita was 58% higher in comparison with the rural GRDP. The equivalent percent in South Ostrobothnia was 48. In 2002, the population of rural North Karelia was 117,900, and in the urban area Joensuu 52,300. Similarly, the rural population in South Ostrobothnia was 159,400, and 34,700 in the urban area of Seinäjoki (Statistics Finland).

The most important industries in terms of output are presented in Table 13 below. The figures show the differences between the regions and between their rural and urban areas. North Karelia is not without justice famous for its forestry-related industries since all the top sectors, measured in output, are forestry related. These industries produce 23% of all the rural output. In contrast, the most important sectors in the urban area belong to the tertiary sector. The strong public sector is due to the Finnish regional policies (particularly before EU membership), whose major goal was to strengthen rural areas. In South Ostrobothnia, the important role of agriculture is shown in the figures which reveal that food manufacturing and agriculture accounted for the largest shares of the rural output. Construction took the second largest share. In both regions, urban areas are centres of trade.

Table 13. The most important sectors in rural and urban areas in terms of output.

Output	Sectors I-III	EUR mill	%-share of Rur./Urb.	Rural/Urban Total EUR mill
North Karelia Rural	Pulp, paper- and products; publishing, printing	269.20	8.0	3379.05
	Manufacture of wood and wood products	266.75	7.9	
	Forestry	244.71	7.2	
North Karelia Urban	Education*	189.55	8.3	2292.15
	Health and social work	186.50	8.1	
	Wholesale and retail trade	158.37	6.9	
South Ostrobothnia Rural	Manufacture of food; beverages and tobacco	769.81	14.4	5356.17
	Agriculture and hunting	485.75	9.1	
	Construction*	373.53	7.0	
South Ostrobothnia Urban	Manufacture of food; beverages and tobacco	256.63	15.6	1649.97
	Wholesale and retail trade	175.69	10.6	
	Construction	152.57	9.2	

If we turn the focus from output to value added, the most important sectors partly overlapped. The importance of the public sector is remarkable since in each of the study areas, health and social work accounted for the second highest amounts of value added. Correspondingly, transport, storage and communication took third place in each region, excluding rural South Ostrobothnia.

Table 14. The most important sectors in rural and urban areas in terms of value added.

Value Added	Sectors I-III	EUR mill	%share of Rur/Urb	Rural/Urban Total EUR mill
North Karelia Rural	Forestry	199.66	11.6	1724.02
	Health and social work	165.42	9.6	
	Transport, storage and communication	150.72	8.7	
North Karelia Urban	Education*	138.59	11.5	1207.67
	Health and social work	135.35	11.2	
	Transport, storage and communication	92.37	7.6	
South Ostrobothnia Rural	Agriculture and hunting	319.52	12.3	2587.25
	Health and social work*	236.92	9.2	
	Wholesale and retail trade	217.47	8.4	
South Ostrobothnia Urban	Wholesale and retail trade	107.01	12.8	837.21
	Health and social work*	106.34	12.7	
	Transport, storage and communication	95.27	11.4	

Tables 15 and 16 summarise employment in euros and in numbers of workers. When considering the capacities of activities as employees, the importance of the public sector becomes even more evident. Distribution was the only activity which did not belong to the public sector.

Table 15. The most important sectors in rural and urban areas in terms of employment, EUR mill.

Wages and Salaries	Sectors I-III	EUR mill	%-share of Rur/Urb	Rural/Urban Total EUR mill
North Karelia Rural	Health and social work	146.41	16.4	894.86
	Public administration and social security	96.85	10.8	
	Wholesale and retail trade	75.46	8.4	
North Karelia Urban	Education	124.15	18.1	686.00
	Health and social work	119.80	17.5	
	Public administration and social security	64.57	9.4	
South Ostrobothnia Rural	Health and social work	209.32	16.0	1311.35
	Wholesale and retail trade	131.50	10.0	
	Education	123.84	9.4	
South Ostrobothnia Urban	Health and social work	93.96	18.8	498.85
	Wholesale and retail trade	64.72	13	
	Education	58.25	11.7	

Table 16. The most important sectors in rural and urban areas in terms of employment , persons.

Employees	Sectors I-III	Number of employees	%-share of Rur/Urb	Rural/Urban Total Persons
North Karelia				
Rural	Health and social work	5276	17.1	30846
	Public administration and social security	3374	11	
	Wholesale and retail trade	3103	10.1	
North Karelia				
Urban	Health and social work	4317	18.7	23079
	Education	3567	15.5	
	Public administration and social security	2249	9.7	
South Ostrobothnia				
Rural	Health and social work	7097	15.6	45471
	Wholesale and retail trade	5411	11.9	
	Education	3445	7.6	
South Ostrobothnia				
Urban	Health and social work	3188	18.7	17092
	Wholesale and retail trade	2665	15.6	
	Education	1621	9.5	

If one compares the ratios of total working hours and value added in the regions as a whole, it is possible to estimate how efficiently the work input is used. The food cluster was more efficient in South Ostrobothnia, whereas the forest cluster was more efficient in North Karelia. Transport and tourism-related industries were more efficient in North Karelia, while trade and health services were more efficient in South Ostrobothnia. These figures reflect specialisation and scale advantages. The figures suggest that the higher value added the industry attains, the more efficient it seems to be in terms of value added per working hour. (Table 17)

Table 17. Value added per working hour (Statistics Finland, Regional accounts 2009).

	Value added / working hour, EUR North Karelia	Value added / working hour, EUR South Ostrobothnia
Agriculture	4.92	6.13
Food industry	25.26	37.23
Forestry	67.94	58.35
Wood pruducts	32.56	24.45
Paper and publishing	57.93	35.94
Construction	13.15	14.77
Transport, storage & communication	38.06	31.42
Trade	18.64	19.48
Hotels and restaurants	12.18	10.75
Health and social work	16.94	19.57
Education	25.69	27.69

This chapter has provided an overview on the data collection, the SAM building process and on the structures and specific features of the two study regions. The SAMs collect macro and mesoeconomic data of the study region and provide a representation of the regions' economic linkages. However, the SAMs are not models as such. In order to model policy shocks and economic changes the following chapters introduce two different approaches of policy modelling that use SAMs as their data sources and accounting frameworks.

4.2 Multiplier analysis

A SAM-based multiplier analysis is an extension of the input-output model. In this approach, SAM accounts are partitioned into endogenous and exogenous accounts. Endogenous accounts are those that react to the changes in incomes in the model, while exogenous accounts are those, expenditures of which are set independently of income. Typically, transactions in the government account, the capital account, and the rest-of-the-world account are regarded as exogenous, since government outlays are essentially policy-determined, the external sector is not under domestic control, and investments are exogenously determined because the model is static. A shock is introduced into the model by changing one of the exogenous accounts. As a consequence of the injection, the model provides solution for the equilibrium level of all the endogenous accounts. (Sadoulet & de Janvry 1995; Round 2003.)

A bi-regional SAM multiplier model is expressed here by following Round (1985) and Roberts (1998). Miller and Blair (2009) provide a profound description of multiplier analysis and its applications. In equation 2, x is a column vector that shows flows from the endogenous account to the combined exogenous account, y is a column vector of account totals of both of the areas (rural and urban), B is a normalised transaction coefficient matrix that includes both intra- and interregional sub-matrices of the SAM. Supposing that the matrix B has constant elements, the aggregate multipliers can be solved by using matrix inversion $y = (I-B)^{-1}x = Mx$.

$$y = By + x \qquad (2)$$

The partitioned form of the inter-regional SAM can be expressed as follows

$$\begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} B_{11} & \tilde{b}_{12} \\ \tilde{b}_{21} & B_{22} \end{bmatrix} \begin{bmatrix} y_1 \\ y_2 \end{bmatrix} + \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \qquad (3)$$

Here subscripts 1 and 2 refer to the two areas, and a superscript ˜ to the off-diagonal sub-matrices. This can be solved as

$$\begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} (I - B_{11})^{-1} & 0 \\ 0 & (I - B_{22})^{-1} \end{bmatrix} \left\{ \begin{bmatrix} 0 & \tilde{b}_{12} \\ \tilde{b}_{21} & 0 \end{bmatrix} \begin{bmatrix} y_1 \\ y_2 \end{bmatrix} + \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \right\} \qquad (4)$$

Which becomes

$$\begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} 0 & D_{12} \\ D_{21} & 0 \end{bmatrix} \begin{bmatrix} y_1 \\ y_2 \end{bmatrix} + \begin{bmatrix} (I - B_{11})^{-1} & 0 \\ 0 & (I - B_{22})^{-1} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \qquad (5)$$

Here, $D_{12} = (I - B_{11})^{-1}\tilde{b}_{12}$ and $D_{21} = (I - B_{22})^{-1}\tilde{b}_{21}$

so that

$$\begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} I & -D_{12} \\ -D_{21} & I \end{bmatrix}^{-1} \begin{bmatrix} y_1 \\ y_2 \end{bmatrix} + \begin{bmatrix} (I - B_{11})^{-1} & 0 \\ 0 & (I - B_{22})^{-1} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \qquad (6)$$

or $y = M_{rz}M_{r1}x$ (7)

M_{rz} is an "inter-regional multiplier matrix" that captures all of the repercussions of spatial flows between the accounts of one region and those of the other. M_{r1}, for one, is an "intra-regional multiplier matrix" that shows the intra-regional multiplier effects resulting from linkages between the accounts in each separate sub- region.

Round (2003) decomposes the inter-regional multiplier matrix M_{rz} as follows

$$M_r = I + (M_{r1} - I) + (M_{r2} - I)M_{r1} + (M_{r3} - I)M_{r2}M_{r1} \qquad (8)$$

where

$I = initial\ injection$
$(M_{r1} - I) = net\ contribution\ of\ transfer\ multiplier$
$(M_{r2} - I)M_{r1} = net\ contribution\ of\ open\ loop\ or\ cross - multiplier\ effects$
$(M_{r3} - I)M_{r2}M_{r1} = net\ contribution\ of\ circular\ or\ closed - loop\ effect$

$y = M_{r3}M_{r2}M_{r1}x$ (9)

M_{r2} is an interregional "open loop" multiplier matrix that captures the effect that one region has upon another after accounting for all "own-region" effects. M_{r3} shows the impacts that pass through

the accounts in the other region before returning to their "own region", thus showing the inter-regional feedback effects. The separation of these effects gives a picture of structural independences within the endogenous accounts of SAM. In the following analysis, the intra-account effects of industries (i.e. traditional input-output multipliers derived separately for the rural and urban areas) are not reported.

4.2.1 Multiplier analyses for South Ostrobothnia and North Karelia

Three different indicators: output multipliers, induced factor income effects and household multipliers are calculated from the SAMs and reported below. These indicators can show the effects that changes in demand or income have, through the web of linkages, on the different actors of the economic system. The SAM output multiplier shows the total change in the value of output in the output of economy following a unit increase in final demand for a single sector's output. In addition to this, because the factors, firms and households are endogenous in the model, the SAM multiplier effects also show induced feedback effects resulting from the household re-spending. Hence, the model can simultaneously solve for the structure of production, the distribution, and the level of income in the economy (Roberts 1999). Roberts defines the key concepts of the multiplier analysis as follows:

Indirect effect: *the economic effects resulting from inter-industry linkages in the economy*
Induced effects: *the economic effects resulting from an increase in income being spent on local goods and services*
Multiplier: *a coefficient which measures the effect of a unit change in one variable (e.g. export demand for a final product) on a variable representing a broader aspect of the regional economy*
Open IO or Type 1 multiplier: *The effect of a change in final demand (e.g. an increase in export demand) for one sector on the output of the whole economy, taking into account the 'indirect' inter-sectoral purchases of input goods and services*
SAM multiplier: *as a Type 1 multiplier, but in addition taking account the distribution of factor earnings and the induced output effects of the spending behaviour of local households as more (or less) income is available as a result of the initial injection*
SAM household multiplier: *the total effect of a unit change in income of a particular household type on the incomes of all households in the economy*

The SAM output multipliers of South Ostrobothnia and North Karlia are presented in Table 18. For example, multiplier value 2.580 for the rural food processing in South Ostrobothnia suggests that a EUR 1 million increase in demand for the rural food processing sector in South Ostrobothnia would result, in addition to the EUR 1 million increase in the rural food sector itself, in an additional

increase of EUR 1.281 million in the output of all rural sectors, since the expansion of the rural food processing increases demand for inputs and services. In addition to the rural effects, the shock will increase industrial activity in the urban area of Seinäjoki by EUR 0.299 million.

Table 18. SAM output multipliers.

	South Ostrobothnia			North Karelia		
	Aggregate	Rural	Urban	Aggregate	Rural	Urban
A-Ragri	**2.722**	**2.361**	0.361	**2.413**	**1.924**	0.489
A-Rdiv	2.094	**1.840**	0.253	1.862	1.514	0.348
A-RPrim	1.543	1.415	0.128	1.561	1.365	0.195
A-Rfood	**2.580**	**2.281**	0.299	**2.366**	**1.945**	0.421
A-Rwood	1.934	1.743	0.191	2.037	**1.694**	0.344
A-Rfuel	1.664	1.501	0.162	1.840	1.496	0.344
A-Rtech	1.875	1.678	0.197	1.739	1.410	0.329
A-Renergy	1.704	1.542	0.163	1.773	1.505	0.268
A-Roth	1.834	1.658	0.176	1.866	1.507	0.359
A-Rconstr	1.814	1.619	0.195	1.925	1.545	0.380
A-Rtrade	1.681	1.499	0.182	1.762	1.426	0.336
A-Rhotels	2.049	1.790	0.260	1.876	1.516	0.359
A-Rtrans	1.512	1.372	0.140	1.610	1.342	0.268
A-Rprivs	1.858	1.627	0.231	1.739	1.410	0.329
A-Rpublics	1.710	1.517	0.193	1.726	1.397	0.329
A-UPrim	1.686	0.522	1.164			
A-Ufood	**2.582**	1.282	**1.300**	**2.363**	0.943	**1.420**
A-Uwood	1.912	0.721	1.191	2.022	0.679	1.343
A-Ufuel	1.698	0.528	1.170	1.834	0.492	1.341
A-Utech	1.874	0.678	1.196	1.739	0.410	1.329
A-Uenergy	1.717	0.551	1.166	1.758	0.496	1.262
A-Uoth	1.843	0.664	1.179	1.860	0.503	1.357
A-Uconst	1.820	0.624	1.197	1.923	0.544	**1.379**
A-Utrade	1.691	0.507	1.185	1.752	0.421	1.331
A-Uhotels	2.052	0.792	**1.260**	1.872	0.514	**1.357**
A-Utrans	1.529	0.384	1.145	1.591	0.332	1.260
A-Uprivs	1.801	0.584	**1.217**	1.731	0.406	1.325
A-Upublics	1.717	0.522	1.195	1.718	0.392	1.326

A high multiplier value of a particular industry suggests that this industry has a strong potential for stimulating local economic activity due to the high amount of linkages it has to other local economic actors. Concerning both of the regions, the highest aggregate multiplier values (i.e. multipliers include both rural and urban effects) were possessed by agriculture and rural and urban food industries. As for the rural areas, the highest multipliers in South Ostrobothnia were those of

agriculture (2.36), rural food industry (2.28) and farm diversified activities (1.84). In rural North Karelia, the three highest multiplier values were possessed by the rural food industry (1.94) agriculture (1.92) and rural wood processing (1.69). The importance of forestry-related activities in North Karelia is visible in these values. As for the urban areas, in South Ostrobothnia the highest values were those of urban food manufacturing (1.30) hotels and catering (1.26) and other private services (1.22), and for the urban area of North Karelia Joensuu, the highest values were those of urban food manufacturing (1.42), urban construction (1.38) and urban hotels and catering (1.36). It is worth noting that rural industry output multiplier values were higher in South Ostrobothnia, while the multipliers generated by increases in demand of the products and services of urban industries were throughout higher in North Karelia.

Economic "leakages" from the urban areas to the rural areas were higher both in South Ostrobothnia and North Karelia compared to the leakages from the rural areas to the urban areas i.e. the share of multiplier induced in the other region was larger. This result implies that urban industries are more dependent on production factors and household demand from the rural area than rural industries are on urban demand and production factors. The most important reason for this is that the major urban manufacturing industries, for example the food industry, use rural production factors. In addition, a significant part of private services and distribution are concentrated in the urban areas.

Tables 19 and 20 present the factor income effects that a unit increase in final demand for a particular sector's output would generate. In South Ostrobotnia, the highest total factor income multipliers were possessed by agriculture, farm diversified activity and rural public services. By separating these multipliers, Table 19 shows that agriculture, other farm-related activities (diversified farms) and other private services generate the highest capital and land income effects in the rural area of South Ostrobothnia, whereas in the urban area of Seinäjoki, the urban primary sector (i.e. forestry and mining), urban transportation and other urban private services possess the highest values.

Table 19. Factor income effects in South Ostrobothnia.

	Total effect	Rural capital & land	Urban capital & land	Employment effect
A-Ragri	**1.579**	**1.037**	0.087	0.456
A-Rdiv	**1.216**	**0.822**	0.062	0.331
A-RPrim	0.970	0.710	0.037	0.222
A-Rfood	1.014	0.549	0.071	0.394
A-Rwood	0.808	0.383	0.059	0.367
A-Rfuel	0.787	0.339	0.045	0.403
A-Rtech	0.746	0.238	0.046	0.461
A-Renergy	0.855	0.504	0.048	0.304
A-Roth	0.790	0.288	0.047	0.455
A-Rconstr	0.784	0.300	0.049	0.435
A-Rtrade	0.977	0.387	0.051	0.539
A-Rhotels	0.898	0.307	0.064	0.527
A-Rtrans	0.952	0.516	0.038	0.398
A-Rprivs	1.075	**0.650**	0.061	0.365
A-Rpublics	**1.078**	0.231	0.051	**0.796**
A-UPrim	0.891	0.180	**0.460**	0.251
A-Ufood	1.016	0.455	0.165	0.395
A-Uwood	0.828	0.225	0.200	0.403
A-Ufuel	0.780	0.157	0.208	0.415
A-Utech	0.743	0.149	0.141	0.453
A-Uenergy	0.862	0.193	0.362	0.307
A-Uoth	0.792	0.166	0.168	0.458
A-Uconst	0.787	0.156	0.195	0.436
A-Utrade	0.982	0.148	0.293	**0.541**
A-Uhotels	0.899	0.231	0.140	0.528
A-Utrans	0.960	0.112	**0.447**	0.402
A-Uprivs	1.028	0.170	**0.436**	0.423
A-Upublics	1.075	0.153	0.131	**0.791**

In North Karelia, the three top sectors measured by the aggregate factor multiplier values are agriculture, other farm-related activity and urban public services. The highest rural capital and land earnings are generated by agriculture, other farm-related activity and rural other primary activities (forestry and mining). The corresponding industries in the urban area of Joensuu are other urban private services, urban transportation and urban energy.

The highest figures for labour income were generated by rural and urban public services and urban trade (distribution). This result is reasonable due to the high labour intensity of these sectors. The labour income in the SAM presents the wages and salaries paid to employees. Thus this figure also

represents employment and changes in employment. These money metric figures can be transformed to numbers of employees by using the employment matrices constructed for the rural and urban areas of South Ostrobothnia and North Karelia in Appendix 2**.**

According to Roberts (1999), employment effects measure the amount of employment generated in the whole economy as a result of a unit increase in demand for output from a particular sector. For example, a EUR 1 million increase in demand for urban public services in North Karelia leads to the total increase of wages and salaries of the whole region of EUR 0.795 million.

Table 20. Factor income effects in North Karelia.

	Total effect	Rural capital & land	Urban capital & land	Employment effect
A-Ragri	**1.502**	**0.907**	0.133	0.462
A-Rdiv	**1.081**	**0.640**	0.102	0.338
A-RPrim	1.037	**0.746**	0.059	0.233
A-Rfood	0.933	0.424	0.114	0.395
A-Rwood	0.855	0.413	0.100	0.342
A-Rfuel	0.832	0.282	0.097	0.453
A-Rtech	0.824	0.297	0.092	0.435
A-Renergy	0.897	0.529	0.083	0.286
A-Roth	0.788	0.260	0.100	0.428
A-Rconstr	0.787	0.182	0.099	0.506
A-Rtrade	0.960	0.324	0.103	**0.534**
A-Rhotels	0.848	0.236	0.101	0.511
A-Rtrans	0.984	0.500	0.079	0.405
A-Rprivs	1.018	0.522	0.097	0.399
A-Rpublics	1.064	0.187	0.099	**0.778**
A-Ufood	0.931	0.354	0.183	0.394
A-Uwood	0.851	0.250	0.261	0.341
A-Ufuel	0.828	0.136	0.241	0.451
A-Utech	0.807	0.105	0.278	0.425
A-Uenergy	0.888	0.195	**0.411**	0.282
A-Uoth	0.785	0.128	0.230	0.427
A-Uconst	0.786	0.135	0.145	0.506
A-Utrade	0.955	0.119	0.304	0.531
A-Uhotels	0.846	0.146	0.190	0.510
A-Utrans	0.974	0.090	**0.483**	0.400
A-Uprivs	1.021	0.106	**0.561**	0.354
A-Upublics	**1.079**	0.108	0.175	**0.795**

Table 21 presents the SAM household multipliers that measure the total effect of a unit change in income of a particular household group on the incomes of all households in the economy. This

effect might be brought by a change, for example, in the income tax regime, or a change in value of transfer earnings from outside the region (Roberts 1999). Table 21 indicates that, for example, an increase of EUR 1,000 in the income of rural commuter households in South Ostrobothnia would increase the income of all the households in South Ostrobothnia EUR 1,290.

Table 21. Household multipliers.

	South Ostrobothnia			North Karelia		
	All HHs	Rural HHs	Urban HHs	All HHs	Rural HHs	Urban HHs
H-Agr	1.322	1.253	0.068	1.267	1.173	0.094
H-Rwork	1.273	1.213	0.061	1.259	1.163	0.096
H-Roth	1.397	1.312	0.085	1.332	1.212	0.120
H-Rcom	1.290	1.226	0.064	1.259	1.164	0.095
H-Uwork	1.299	0.233	1.066	1.250	0.157	1.093
H-Uoth	1.383	0.301	1.082	1.322	0.205	1.117
Rep-tourist	0.344	0.269	0.076	0.329	0.216	0.113

4.2.2 Discussion

The output multiplier values demonstrate the still important role of agriculture and food manufacturing in both of the study regions. In the urban areas, however, services and construction were among the industries which possessed the highest income generating potential through economic linkages. In general, the output multipliers in both of the regions were relatively low, indicating that these regions are relatively open economies. This implies that the links to the rest of the country are important.

In comparison with the previous SAM multiplier study (Kola & Nokkala 1999) of these regions concerning the base year 1995, the multipliers presented above are significantly lower. The former study reported output multiplier values that ranged from 4.92 for construction to 10.54 for food manufacturing in North Karelia, and from 3.57 for pulp and paper to 8.65 for food production in South Ostrobothnia. The earlier study, however, concerned the regions as a whole, and therefore could not show rural-urban linkages within the regions. Compared with other European, rural-urban multiplier studies, the magnitude of the multipliers of this study are more equal. Roberts' (1998) analysis of Grampian Scotland (base year 1989), Psaltopoulos' et al. (2006) analyses of Archanes,

Nikos Kazantzakis and Heraklion in Greece (base 1998) reported aggregate output multiplier values ranging from 1.52 to 2.71 in Greece and from 1.00 to 2.07 in Scotland. The results suggest that these Finnish regions have been closed economies compared with these other European "remote" regions. However, these Finnish regions have recently become more open and more linked with the rest of the country and the rest of the world. During the period 1995-2002, Finland became a member of the European Union and the economic structures of the study regions have changed so that services and manufacturing have become relatively more important. Regional exports….

In this study, the urban and rural industries, for example the food industries, had almost an equal potential for stimulating the whole economies of South Ostrobothnia and North Karelia. Yet, urban industries generated significantly larger effects on the rural areas (through inter-regional linkages) than vice versa. The explanation for this is the reliance of urban activities on the inputs and factors from rural industries and households, and the dependence on rural household demand. This latter result corresponds to the findings of Roberts (1998). In rural areas the primary sectors generated the highest capital and land factor incomes, whereas in the urban areas, transportation was among the most important industries in terms of land and capital incomes. In contrast, rural and urban public services and urban trade (distribution) generated the greatest labour income effects. The latter can be traced back to the high labour intensity of these services.

The household multiplier values suggest that, after taking account of all the linkages and interdependencies, an extra income allocated to the low income households, i.e. pensioners, unemployed and students, would generate a higher overall increase in incomes of households if compared to the situation when the corresponding income transfer would have been allocated to working (higher income) households. This result is consistent with previous SAM-multiplier studies (Roberts 1998; Psaltopoulos et al. 2006). This is reasonable, since poor households typically tend to consume their extra income, while wealthier households have a higher propensity to save. When comparing the income-generating potential of the rural households with the urban households in North Karelia, rural households have a higher potential than their urban peers. In contrast in South Ostrobothnia, the income-generating potential varies among the household groups. Therefore, it was not possible to draw a conclusion whether the rural or the urban households would possess higher income-generating potential.

4.3 Multiplier scenario analyses

In addition to the derivation of multipliers explained and presented above, SAM multiplier analyses can be used to create economic scenarios. In reality, the effects of these scenarios or economic changes will not, however, appear immediately; rather the adjustments occur over time. Notwithstanding, SAM techniques are used for these purposes even if, in practice, they are static in nature (Roberts 1999).

Four different scenario analyses were carried out with the SAM multiplier model. These different analyses are directed towards the specific key sectors and policy measures that both academics and policy makers have often defined as important sectors and measures for the development of rural regions. The output multiplier analysis above showed that agriculture possessed the highest output and total factor income multipliers in both of the regions. Therefore, and because agriculture is generally considered one of the major economic sectors in preserving livelihood in rural areas, two agricultural policy-related scenarios are performed. Hotels and catering were also among the sectors with the highest output multiplier values in both of the regions. The policy-specific literature and more specific justifications for these particular policy scenarios is situated to the parallel CGE policy analyses presented in Chapter 6 for the diversified farm scenario, in Chapter 7 for the transportation-infrastructure scenario, and in Chapter 8 for the tourism scenario.

4.3.1 Agricultural policy scenarios

The first scenario presents a simultaneous cut in agricultural subsidies and the corresponding subsidy transfer to other farm-related activities. This scenario is parallel to the CGE analysis in Chapter 6 that provides a discussion of CAP II Pillar modulation and justifications for this scenario. In addition, it details how the diversified activities were built in the SAMs.

In Finland, due to the strong structural change, other farm-related economic activities, in addition to traditional agriculture, have become increasingly important for the rural areas of Finland. Farm accounting in 2000, for the first time, collected information on these business activities and their economic importance. According to TIKE (2006), the term “diversified farm” refers to a farm that has other business activities in addition to agriculture or forestry. These can be, for example, food

processing, tourism services and machinery contracting services. The farm structure studies of 2003 and 2005 (TIKE 2004; TIKE 2006) have collected further information on these farms, and the most recent farm accounting was carried out for the year 2010. These results, however, were not yet available. In 2005, there were 24,249 diversified farms in Finland of which 2,596 were located in South Ostrobothnia and 990 in North Karelia. The number of diversified farms both in 2003 and 2005 was the highest in South Ostrobothnia among all the Finnish NUTS3 regions. Information from the Farm Accountings is utilised in this research.

In 2002, the total amount of the agricultural subsidy in South Ostrobothnia was EUR 192.6 million. Thus the 30% cut in subsidies amounted to EUR 57.8 million. Correspondingly, the total amount of agricultural subsidy in North Karelia was EUR 70.8 million, and the 30% cut was EUR 21.24 million. For comparison, the second scenario presents a 10% increase in agricultural subsidies.

Table 22. Agriculture scenarios

Subsidy transfer to the diversified activity					**Increase in agricultural subsidy**			
	South Ostrobothnia		North Karelia		South Ostrobothnia		North Karelia	
	Increase in output (€mill)	Ch(%)	Increase in output (€mill)	Ch(%)	Increase in output (€mill)	Ch(%)	Increase in output (€mill)	Ch(%)
A-Ragri	-68.968	-17.99	-25.169	-17.444	25.739	6.713	9.039	6.265
A-Rdiv	54.954	53.703	20.706	97.239	1.655	1.617	0.269	1.262
A-RPrim	-0.347	-0.164	-0.138	-0.044	0.431	0.204	0.174	0.055
A-Rfood	-3.688	-0.479	-0.595	-0.464	3.838	0.499	0.564	0.440
A-Rwood	-0.544	-0.157	-0.163	-0.030	0.753	0.218	0.236	0.044
A-Rfuel	-0.945	-1.302	-0.771	-0.325	0.564	0.777	0.444	0.187
A-Rtech	-0.912	-0.121	-0.250	-0.087	1.289	0.171	0.268	0.093
A-Renergy	-0.080	-0.171	-0.055	-0.110	0.319	0.679	0.112	0.223
A-Roth	-0.386	-0.171	-0.055	-0.096	0.465	0.206	0.067	0.118
A-Rconstr	-0.238	-0.064	-0.058	-0.025	0.381	0.102	0.119	0.051
A-Rtrade	-4.355	-1.221	-1.137	-0.520	3.413	0.957	0.829	0.379
A-Rhotels	-0.130	-0.235	-0.029	-0.068	0.253	0.458	0.066	0.154
A-Rtrans	-0.902	-0.375	-0.396	-0.172	1.097	0.456	0.391	0.170
A-Rprivs	-2.435	-0.328	-0.276	-0.078	4.000	0.538	0.731	0.206
A-Rpublics	-1.111	-0.164	-0.324	-0.062	1.276	0.189	0.309	0.059
A-UPrim	-0.062	-0.210			0.071	0.238		
A-Ufood	-1.230	-0.479	-0.349	-0.464	1.279	0.499	0.331	0.440
A-Uwood	-0.029	-0.172	-0.078	-0.031	0.042	0.246	0.113	0.045
A-Ufuel	-0.207	-1.312	-0.415	-0.325	0.123	0.781	0.239	0.187
A-Utech	-0.167	-0.122	-0.189	-0.087	0.235	0.172	0.202	0.093
A-Uenergy	-0.038	-0.171	-0.083	-0.110	0.150	0.679	0.169	0.223

A-Uoth	-0.018	-0.176	-0.029	-0.096	0.021	0.210	0.036	0.118
A-Uconst	-0.097	-0.064	-0.031	-0.025	0.156	0.102	0.064	0.051
A-Utrade	-2.145	-1.221	-0.823	-0.520	1.681	0.957	0.600	0.379
A-Uhotels	-0.073	-0.235	-0.031	-0.068	0.142	0.458	0.069	0.154
A-Utrans	-0.530	-0.375	-0.243	-0.172	0.644	0.456	0.240	0.170
A-Uprivs	-1.088	-0.327	-0.415	-0.078	1.787	0.538	1.106	0.207
A-Upublics	-0.543	-0.165	-0.314	-0.062	0.626	0.190	0.295	0.058
Total	**-36.316**	**-0.518**	**-11.711**	**-0.206**	**52.428**	**0.748**	**17.085**	**0.301**
Rural output	-30.088	-0.562	-8.710	-0.258	45.470	0.849	13.620	0.403
Urban output	-6.228	-0.377	-3.001	-0.131	6.958	0.422	3.465	0.151

	South Ostrobothnia		North Karelia		South Ostrobothnia		North Karelia	
	Increase in factor payments (€mill)	Ch(%)	Increase in factor payments (€mill)	Ch(%)	Increase in factor payments (€mill)	Ch(%)	Increase in factor payments (€mill)	Ch(%)
Capital and land rents	-13.791	-0.854	-6.327	-0.468	21.635	1.340	7.364	0.545
Income from employment	-7.191	-0.397	-2.621	-0.166	8.775	0.485	3.269	0.207
Total factor earnings	**-20.982**	**-0.613**	**-8.948**	**-0.305**	**30.411**	**0.888**	**10.633**	**0.363**

Table 22 presents the impacts of agricultural subsidy shocks on sectoral, rural, urban and regional outputs. The first column shows the impact of the first scenario on the outputs in million EUR, and the second column shows the same effects in percent changes from the original 2002 values. In addition, changes in factor earnings are presented at the bottom of the table. For example, in South Ostrobothnia, a EUR 57.8 million cut in agricultural support from traditional agriculture caused a EUR 68.968 million decrease in agricultural output and simultaneously, a EUR 54.954 million increase in the output of diversified activity. The total changes in both of the regions were negative, however small. One explanation for this result can be found from the output multiplier values presented above. The analysis showed that the output and factor income multipliers of agriculture were bigger in both of the regions compared with those of the diversified activities. These multiplier values reflect the ability of a certain activity to stimulate local economic activity due to its economic linkages. Hence, the results suggest that traditional agriculture can generate extra income more efficiently due to its linkages, and is thus able to use the income subsidies more efficiently compared with other farm-related activities. However, it is worth remembering that the multiplier analysis does not allow price changes or factor movements.

In contrast, a EUR 19.26 million increase in agricultural subsidy in South Ostrobothnia generated a EUR 52.428 million increase in the (regional) total output. Since only 25.7 million of this output

increase originated from agriculture, the results suggest that agricultural subsidy is able to generate substantial positive spillover effects in the rural region. The extra agicultural support benefited not only the other rural industries, but also the urban industries through the rural-urban linkages. Impacts in North Karelia were also positive, yet relatively smaller.

Table 23. Household income changes

	South Ostrobothnia		North Karelia		South Ostrobothnia		North Karelia	
	Increase in household income (€mill)	Ch(%)	Increase in household income (€mill)	Ch(%)	Increase in household income (€mill)	Ch(%)	Increase in household income (€mill)	Ch(%)
H-Agr	-7.867	-1.804	-5.539	-3.539	13.246	3.038	4.027	2.573
H-Rwork	-3.871	-0.338	-1.343	-0.158	5.024	0.438	2.016	0.237
H-Roth	-0.568	-0.081	-0.060	-0.011	0.917	0.131	0.126	0.024
H-Rcom	-0.871	-0.373	-0.247	-0.134	1.199	0.513	0.332	0.181
H-Uwork	-1.588	-0.339	-0.856	-0.137	2.024	0.432	1.163	0.186
H-Uoth	-0.164	-0.095	-0.025	-0.010	0.239	0.139	0.044	0.017
Rep-tourist	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	**-14.929**	**-0.464**	**-8.070**	**-0.302**	**22.650**	**0.704**	**7.707**	**0.289**

When looking at the impacts on household incomes, the relative percentage changes were larger compared with the changes in terms of activity outputs, the major factor being changes in agricultural household incomes. In the diversified farm scenario, agricultural households in North Karelia lost more than agricultural households in South Ostrobothnia. Partly, this is due to the differences in the industrial structures of the diversified farms of the regions. In addition in South Ostrobothnia, a significantly larger part of the agricultural household income already comes from diversified activities. It is worth noticing that rural and urban household groups earn factor incomes also crosswise from rural and urban industries. Due to this fact and to changes in household expenditures, impacts drift to all the household groups through a complex web of linkages.

4.3.2 Transportation investment and tourism scenarios

The first two scenarios concentrated on the primary sector and thus they predominantly stimulated rural areas. The following scenarios consider the changes through tertiary sectors, i.e. transportation

and infrastructure services and tourism. These two sectors have been constantly named as being the key sectors with the potential to stimulate rural development. Further, these two industries are important for both the rural and urban areas of the study regions.

The first five columns of Table 24 present the impacts of a 10% increase in investments of transportation and infrastructure. Remembering that the investments in the SAMs are measured in commodities, the extra injection is not allocated to either rural or urban transportation activities, but rather to the overall investments of transportation and infrastructure building and services. One justification for this approach is the nature and general objectives of transportation infrastructure investments. Indicatively, it would not be reasonable to limit the investments to a specific part of the region, since infrastructure investments typically aim at connecting and evening out differences that arise from distances.

In South Ostrobothnia, infrastructure investment of EUR 10.640 million increased the regional total output by EUR 10.49 million, of which rural output accounted for 67%. Industries that benefited most from the transportation infrastructure investment, in addition to the transportation industries, were rural and urban fuel, trade, and hotel and catering activities. In North Karelia, a EUR 8.229 million injection increased the regional total output by EUR 10.087 million, of which rural output accounted for 60%. The greatest benefits went to transportation, trade, hotel and catering, and other private services. Total factor earnings increased by EUR 6.498 million in South Ostobothnia and EUR 6.108 million in North Karelia.

Table 24. Infrastructure investment and tourism scenarios.

Infrastructure investment					**Tourism**			
	South Ostrobothnia		North Karelia		South Ostrobothnia		North Karelia	
	Increase in output (€mill)	Ch(%)	Increase in output (€mill)	Ch(%)	Increase in output (€mill)	Ch(%)	Increase in output (€mill)	Ch(%)
A-Ragri	0.133	0.035	0.073	0.051	0.342	0.089	0.259	**0.179**
A-Rdiv	0.038	0.038	0.011	0.054	0.103	**0.100**	0.038	**0.177**
A-RPrim	0.077	0.037	0.100	0.032	0.111	0.053	0.137	0.044
A-Rfood	0.255	0.033	0.086	0.067	0.528	0.069	0.253	**0.197**
A-Rwood	0.150	0.043	0.167	0.031	0.195	0.056	0.186	0.035
A-Rfuel	0.086	**0.119**	0.176	0.074	0.069	0.095	0.403	**0.170**
A-Rtech	0.319	0.042	0.210	0.073	0.341	0.045	0.223	0.078
A-Renergy	0.041	0.088	0.047	0.093	0.041	0.088	0.045	0.090

A-Roth	0.087	0.039	0.041	0.071	0.163	0.072	0.076	**0.133**
A-Rconstr	0.090	0.024	0.151	0.064	0.069	0.018	0.081	0.034
A-Rtrade	0.373	**0.105**	0.295	**0.135**	0.775	**0.217**	0.356	**0.163**
A-Rhotels	0.075	**0.135**	0.053	**0.124**	0.621	**1.125**	0.518	**1.204**
A-Rtrans	4.461	**1.854**	4.133	**1.799**	0.840	**0.349**	0.886	**0.386**
A-Rprivs	0.665	0.090	0.377	**0.106**	0.693	0.093	0.424	**0.119**
A-Rpublics	0.169	0.025	0.122	0.023	0.191	0.028	0.130	0.025
A-UPrim	0.013	0.045			0.018	0.061		
A-Ufood	0.085	0.033	0.050	0.067	0.176	0.069	0.148	0.197
A-Uwood	0.010	0.057	0.080	0.032	0.010	0.060	0.089	0.035
A-Ufuel	0.019	**0.122**	0.095	0.074	0.015	0.095	0.217	0.170
A-Utech	0.058	0.043	0.157	0.072	0.062	0.045	0.169	0.077
A-Uenergy	0.019	0.088	0.071	0.093	0.019	0.088	0.068	0.090
A-Uoth	0.004	0.041	0.022	0.071	0.007	0.073	0.041	0.133
A-Uconst	0.037	0.024	0.081	0.064	0.028	0.018	0.043	0.034
A-Utrade	0.184	**0.105**	0.214	**0.135**	0.382	0.217	0.258	0.163
A-Uhotels	0.042	**0.135**	0.055	**0.124**	0.349	1.125	0.539	1.204
A-Utrans	2.620	**1.854**	2.533	**1.799**	0.493	0.349	0.543	0.386
A-Uprivs	0.297	0.090	0.570	**0.107**	0.310	0.093	0.630	0.118
A-Upublics	0.083	0.025	0.116	0.023	0.092	0.028	0.124	0.025
Total	**10.490**	**0.150**	**10.087**	**0.178**	**7.045**	**0.101**	**6.884**	**0.121**
Rural output	7.019	0.131	6.043	0.179	5.082	0.095	4.014	0.119
Urban output	3.472	0.210	4.044	0.176	1.963	0.119	2.870	0.125

	South Ostrobothnia		North Karelia		South Ostrobothnia		North Karelia	
	Increase in factor payments (€mill)	Ch(%)	Increase in factor payments (€mill)	Ch(%)	Increase in factor payments (€mill)	Ch(%)	Increase in factor payments (€mill)	Ch(%)
Capital and land rents	3.772	0.234	3.587	0.266	1.879	0.116	1.835	0.136
Income from employment	2.726	0.151	2.521	0.159	1.789	0.099	1.721	0.109
Total factor earnings	6.498	0.190	6.108	0.208	3.668	0.107	3.556	0.121

The fourth scenario, the increase in tourism demand, was modelled by increasing the income of the tourist households. This household group represents tourism coming from outside of these regions, i.e. tourists from the other Finnish regions and from foreign countries. In the SAMs, this household group earns its income from the rest of the world account. Thus, in the multiplier analysis, the exogenous injection of tourism is allocated straight to a specific household group instead of subsidising tourism-related industries. The consumption structures of the tourist households were drawn from the Tourist Satellite Accounts of Statistics Finland.

In South Ostrobothnia, increase in tourism demand for local goods and services of EUR 6.087 million increased the regional total output by EUR 7.045 million and in North Karelia, a tourism injection of EUR 5.968 million increased the regional total output by EUR 6.884 million. Trade, hotels and catering, transportation and other private services were the industries that gained the most. Since diversified activity also includes tourism it earned extra income. The factor earning increased EUR 3 million in both of the regions.

Table 25. Household income changes due to infrastructure and tourism scenarios.

	South Ostrobothnia		North Karelia		South Ostrobothnia		North Karelia	
	Increase in household income (€mill)	Ch(%)	Increase in household income (€mill)	Ch(%)	Increase in household income (€mill)	Ch(%)	Increase in household income (€mill)	Ch(%)
H-Agr	0.309	0.071	0.176	0.113	0.353	0.081	0.202	0.129
H-Rwork	1.441	0.126	1.403	0.165	0.941	0.082	0.866	0.102
H-Roth	0.186	0.027	0.074	0.014	0.134	0.019	0.038	0.007
H-Rcom	0.350	0.150	0.273	0.148	0.207	0.088	0.182	0.099
H-Uwork	0.720	0.154	0.986	0.158	0.414	0.088	0.643	0.103
H-Uoth	0.086	0.050	0.049	0.019	0.047	0.027	0.029	0.011
Rep-tourist	0.000	0.000	0.000	0.000	6.087	10.000	5.968	10.000
Total	3.091	0.096	2.960	0.111	8.183	0.255	7.930	0.298

As for the household income effects, transport investment benefited especially the working households, and commuters and urban household gained the most. Exogenous increase in tourism generated extra income also for the local households and, as expected, the working households benefited most.

4.3.3 Discussion

Four different SAM multiplier scenario analyses were employed in order to investigate the potential of the different economic shocks entering the local economies through agriculture, transportation and tourism industries. Previously, in order to outline the networks of economic linkages in these regions, output, factor income and household multipliers were derived. Roberts (1998) argues that "the high multiplier values can be interpreted such that the sectors with the highest values are key sectors, where investment would induce, through the linkages, the greatest benefits for the whole area". Without dispute, agriculture, diversified activity and hotels and catering were among the

industries possessing the highest multiplier values in both of the study regions. In contrast, the multiplier values of transportation were among the lowest. However, transportation infrastructure industries have other important qualities to offer, such as its ability to help overcome the drawbacks caused by remoteness. Not surprisingly, infrastructure investments have become an important policy instrument in improving competitiveness and reducing regional disparities both in Finland and in the European Union (European Commission 2007, 2008a). Therefore, it was reasonable to include the transport infrastructure scenario in this study.

North Karelia was more responsive to both the transportation and the tourism injections, whereas the agricultural injections resulted in greater changes in South Ostrobothnia. The relative importance of the different activities and also the relative importance of rural as opposed to urban economies are reflected in these results. Even if the absolute values of the injections were small in relation to the whole economies, these scenarios, excluding the agricultural subsidy transfer, generated positive impacts clearly exceeding the values of expenditures allocated to these measures. Increase in agricultural support generated significant increases in the outputs of the other industries due to the high level of linkages. This support benefited not only rural areas but the positive impacts were also carried to the urban industries and households through the factor earnings and increased demand.

The limitations and drawbacks of the SAM multiplier analysis are well known and have been reported (e.g. Sadoulet & de Janvry 1995; McCann 2001; Round 2003). Since the capacity constraints are neglected, the multiplier analysis tends to overestimate the total effects. This total response is also overestimated, because substitution effects are not allowed due to fixed prices. In practice, price changes would offset excess demand (supplies) in any of the markets and thus mitigate the total effects. However, the fact that the accounts are divided into endogenous and exogenous may cause both overestimation and underestimation of the effects, since part of the endogenous responses are absent. For example, changes in government expenditures and trade balances resulting from the injections would not be fed back into the system. The general equilibrium analysis that is introduced and applied to policy analyses in the following chapters aims at overcoming these drawbacks.

5 Computable General Equilibrium model

The previous chapter explained Social Accounting Matrices, their contents and the construction process, and introduced the results of the SAM multiplier analysis. Multiplier analysis and Computable General Equilibrium models share the same data base. However, the CGE analysis can bring additional insights and richness to the policy analyses since it can relax some rigidities of the multiplier analysis. The most important features are endogenous prices and the relaxation of the assumption of fixed factor supplies. In addition, the CGE framework allows, for example, factor movements and endogenous changes in investments and saving and trade balances.

This chapter provides information on CGE-modelling; general information on CGE models and a basic CGE theory are first presented followed by the details of the empirical model used in this study.

Wing (2004) characterises computable general equilibrium models (CGE) as simulations that combine the abstract general equilibrium structure with realistic economic data in order to solve numerically for the levels of supply, demand and price supporting equilibrium across a specified set of markets. Thus the Walrasian general equilibrium prevails as supply and demand are equalised across the interconnected markets in the economy described by the model. The Walrasian general equilibrium models are grounded in neoclassical theory. The starting point for a CGE model is the circular flow of commodities in a closed economy where both the source and the user of products and values are defined, and each actor's income must be balanced by other actors' expenditures.

5.1 General equilibrium theory

A base structure of general equilibrium models is presented by following Shoven and Whalley (1992). In the simple CGE model there are N commodities, 1,…,N, each having a nonnegative price $p_i \geq 0$. The vector $\mathbf{p} = p_1,\ldots,p_N$ denotes market prices. Consumers own the nonnegative economy wide endowment of commodity i (W_i). The endowment is assumed to be strictly positive for at least one i. Nonnegative and continuous market demand functions ξ (**p**) are homogenous at degree zero in prices. Hence, doubling all prices also doubles incomes, whereas the physical quantities remain unchanged. Because the demand functions are homogenous of degree zero in prices, the normalisation of prices is possible:

$$\sum_{i=1}^{N} p_i = 1 \qquad (10)$$

According to Walras' law, the value of market demands equals the value of the economy's endowment:

$$\sum_{i=1}^{N} p_i \, \xi_i(\boldsymbol{p}) = \sum_{i=1}^{N} p_i \, W_i \qquad (11)$$

and the value of market excess demands equals zero at all prices,

$$\sum_{i=1}^{N} p_i \, (\xi_i(\boldsymbol{p}) - W_i) = 0 \qquad (12)$$

This condition holds for any set of prices, whether or not they are equilibrium prices. A general equilibrium in this system is a set of prices p_i^* such that

$$\xi_i(\boldsymbol{p}^*) - W_i \leq 0, \qquad (13)$$

with equality if $p_i^* > 0$. Accordingly, equilibrium prices clear markets.

When production is included in the model, the production technology is also specified. Shoven and Whalley (1992) present production such that it has a finite number K of constant-returns-to-scale activities or methods of production. Each activity is described by coefficients $\boldsymbol{a}_{ij}$ denoting the use of good *i* in activity *j* when the activity is operated at unit intensity. A negative sign refers to an input and respectively, a positive sign to an output. The non square matrix $\boldsymbol{A}$ below displays these activities. The matrix lists different possible ways of producing commodities. It can be used in any nonnegative linear combination:

$\boldsymbol{A}$=

$$\begin{bmatrix} -1 & 0 & \dots & 0 & a_{1,N+1} & \cdots & a_{1,j} & \cdots & a_{1,K} \\ 0 & -1 & \dots & 0 & \cdot & \dots & \cdot & \cdots & \cdot \\ \cdot & 0 & \cdots & \cdot & \cdot & \dots & \cdot & \cdots & \cdot \\ \cdot & \cdot & \dots & 0 & \cdot & \cdots & \cdot & \cdots & \cdot \\ 0 & \cdot & \dots & -1 & a_{N,N+1} & \cdots & a_{N,j} & \cdots & a_{N,K} \end{bmatrix}$$

The possibility of free disposal of each commodity is presented by the first *N* activities that refer to "slack" activities. This implies that no complementary slackness condition would appear in equilibrium condition. Therefore, if there is excess supply of any commodity, disposal occurs through the use of a disposal activity. However, this is not the case in the empiric model of this research. The model is solved in GAMS as an MCP (mixed complementary) problem. According to Rutherford and Paltsev (1999), MCP formulation explicitly describes the equilibrium condition, i.e. zero profit, market clearance and income balance, which are automatically constructed by MPSGE (see Rutherford 1994).

Activities are assumed to be nonreversible, implying that it is impossible to produce inputs from outputs. The nonnegative vector $\mathbf{X} = X_1,\ldots, X_K$ denotes levels of intensity of operation associated with each activity. Production is assumed to be bounded: it is not possible to produce infinite amounts of outputs from finite inputs. This corresponds to the "no free lunch" assumption. This assumption states that the set of **X** such that

$$\sum_{j=1}^{K} a_{ij} X_j^* + W_i \geqq 0 \quad for\ all\ i \qquad (14)$$

is a contained set within a bounded set. The model equilibrium is characterised by a set of prices and levels of production, for each industry, such that the market demand equals supply for all commodities.

$$\xi_i(\boldsymbol{p}^*) = \sum_{j=1}^{K} a_{ij} X_j^* + W_i \quad for\ all\ i = 1, \ldots . N; \qquad (15)$$

The producer maximizes profits such that no activity does any better than breaks even at the equilibrium prices:

$$\sum_{i=1}^{N} p_i^* a_{ij} \leq 0 \ \left(= 0\ if\ X_j^* > 0\right) \ \ for\ all\ j = 1, \ldots, K. \qquad (16)$$

According to Hertel (2002), an important benefit follows from the exhaustive accounting in the CGE analysis. Walras' Law states that if (a) all households are on their budget constraint (subject to explicitly defined inter-household transfers or borrowing), (b) all firms exhaust their revenues on

factor payments, taxes, and transfers of excess profits to households, and (c) all markets are in equilibrium, then one of the equilibrium relationships in the model will be redundant and may be dropped. This, in turn, provides a check on the consistency of the CGE model. Accordingly, a violation of Walras' Law indicates a misspecification in the model since the modelled economy would violate the sum of individual budget constraints.

General equilibrium analysis also has a clear normative content. According to Hertel (2002, 1375) "CGE analysis has its intellectual origins in the debate over the feasibility of the centralized computation of a Pareto optimal allocation of resources within the economy." Mas-Colell et al. (1995) define the welfare properties of Walrasian Equilibria as follows: a economic outcome is Pareto optimal if there is no alternative feasible outcome at which every individual in the economy is at least as well off and some individual is strictly better off. The conclusion that Walrasian allocations yield Pareto optimal allocations is an expression of the first fundamental theorem of welfare economics. Concerning competitive market economies, the first fundamental welfare theorem is a formal expression of Adam Smith's invisible hand. According to the second fundamental theorem of welfare economics, under convexity assumptions, a policy maker can achieve any desired Pareto optimal allocation by redistributing wealth in a lump-sum fashion and then letting the market work. Therefore, the second welfare theorem provides a theoretical affirmation for the use of competitive markets in achieving distributional policy objectives.

Mas-Colell et al. (1995, 82) point out that the welfare theorem also provides the means of evaluating the consumer's level of well-being. Presuming that a consumer has a rational, continuous, and locally nonsatiated preference relation, and assuming that the consumer's expenditure and utility functions are differentiable, and focusing the welfare effects of price changes, a money metric indirect utility function can be constructed and through it can be determined whether a price change makes the consumer better off or worse off. Two choices of price vectors $\boldsymbol{p} > 0$, either initial price vector $\boldsymbol{p^0}$ or the new price vector $\boldsymbol{p^1}$, lead to Hicks' (1939) measures of welfare, which are the equivalent variation (EV) and the compensating variation (CV). Supposing that $u^0 = v(p^0, w)$ and $u^1 = (p^1, w)$ and noting that $e(p^0,u^0) = e(p^1,u^1) = w$,

$$EV(p^0, p^1, w) = e(p^0, u^1) - e(p^0, u^0) = e(p^0, u^1) - w \qquad (17)$$

$$CV(p^0, p^1, w) = e(p^1, u^1) - e(p^1, u^0) = w - e(p^1, u^0) \qquad (18)$$

The equivalent variation is the euro amount that the consumer would be indifferent to accepting instead of the price change. In other words, EV is the change in wealth that would be equivalent to the price change in terms of its welfare impact. In practice, EV is negative if the price change would make the consumer worse off. Compensating variation describes the same change from the policy maker's point of view. It measures the net revenue of a policy maker who should compensate the consumer for the price change after it occurs, and thus bring the consumer to her original utility level. The CV is negative if the policy maker pays the consumer compensation for her loss. From the consumer's point of view this is the negative of the amount that the consumer would be willing to accept in order to be indifferent towards the price change.

The proof of the existence of equilibrium is based on the fixed point theorems. Arrow and Debreu (1954) were the first who applied these theorems to prove the existence of equilibrium in general equilibrium modelling framework. According to Shoven and Whalley (1992), fixed point theorems involve continuous mappings of the unit simplex into itself such that if $\boldsymbol{S}$ denotes the set of vectors **X** on the unit simplex

$$\sum_{i=1}^{N} X_i = 1, \quad X_i \geq 0, \qquad (19)$$

then the mapping $F(\mathbf{X})$ is such that

$$\sum_{i=1}^{N} F_i(\boldsymbol{X}) = 1, \quad F_i(\boldsymbol{X}) \geq 0, \qquad (20)$$

and F satisfies continuity properties. The two following mappings are most often applied. Point-to-point mappings (i.e. $F(\mathbf{X})$ is a point on the unit simplex) are applied when the Brouwer fixed point theorem is used, and point-to-set mappings (i.e. $F(\mathbf{X})$ is a set on the unit simplex) are applied when the Kakutani fixed point theorem is used in general equilibrium theory.

Scarf (1973, 28) states these theorems as follows:

> Brouwer's theorem: Let Y = F(**X**) be a continuous function mapping the simplex into itself; then there exists a fixed point of the mapping, that is, a vector such that **X*** = F(**X***).
>
> Kakutani's theorem: Let the point-to-set mapping $\mathbf{X} \rightarrow \phi(\mathbf{X})$ of the simplex S into itself be upper semicontinuous. Assume that for each $\mathbf{X}, \phi(\mathbf{X})$ is a nonempty, closed, convex set. Then there exists a fixed point $\widehat{\mathbf{X}} \in \phi(\widehat{\mathbf{X}})$.

Further discussion of the existence and the uniqueness of the equilibrium is beyond the scope of this applied study. However, a discussion can be found, for example, from Arrow and Debreu 1954; Debreu 1959; Kehoe and Whalley 1985; Shoven and Whalley 1992 and Mas-Colell et al. 1995.

5.2 CGE applications

Kenneth Arrow and Gerard Debreu have laid the basis for the theoretic structure of the Walrasian general equilibrium in the 1950, and the first operational applied general equilibrium model was developed by Leif Johansen (1960) in the late 1950s. Since then, along with the progress in theory, data and computing techniques and computing power, CGE models have been applied to a wide range of topics, and their importance as a tool for research and policy analysis has constantly grown.

Developing economists have been among the early appliers of the CGE models since the early 1970s, followed by more recent studies e.g., Dervis et al 1982; Robinson 1988; Sadoulet and de Janvry 1995, and several studies by the International Food Policy Research Institute, e.g. Lofgren at al. (2002), whose model is applied in this study. The studies of Shoven and Whalley (1992), and Whalley (1985) pioneered a multiregional CGE modelling applied to taxation and trade policy issues. Further, the so-called Australian School has been analysing the Australian economy and its policies with several versions of the ORANI GE model since the 1980's. Their model has been applied to many other countries as well (e.g. Dixon et al. 1982). Doi (2006) concludes that at present, CGE approaches are widely applied to evaluate trade policies, taxation policies, income distribution, industrial policy, environmental problems, transportation and other infrastructure policies. Common factors with these policy topics for evaluation are that they cause structural, long-

term impact including price changes and GDP growth, over various entities (households, enterprises, government) and industrial sectors of urban, regional, national and international economies.

In Finland, recent studies applying CGE models are for example, Törmä et al.'s (1995) study of the impacts of EU membership and the VATT tax reform of Finnish economy; Vaittinen's (2004) study on trade policy and EU integration; Kinnunen (2005) study, in which he built a dynamic, imperfect competition CGE model and applied it to the analysis of the consequences of changes caused by the EU's shipping and alcohol policy; and the study of Honkatukia et al. (2009) concerning the distributional effects of climate policy package. More examples on the previous empirical studies are provided in Chapters 6, 7 and 8.

5.3 The CGE model

The CGE model used in this research is based on the standard stationary general equilibrium framework designed by Lofgren et al. (2002) for the International Food Policy Research Institute (IFPRI). However, the model is slightly modified in order to follow the core structure of the SAMs. The modifications are specified in Phimister et al. (2006). Since the model follows the structures of the SAMs specified in the previous chapter, it is a bi-regional rural-urban model.

The model is comprised of a set of linear and nonlinear simultaneous equations that determine the behaviour of the economic agents in the model. The model is square: the number of equations is equal to the number of variables. In this class of models, this is a necessary (but not sufficient) condition for the existence of a unique solution. The equations also include a set of macroeconomic constraints that cover factor and commodity markets, balances for government, current accounts and savings and investments. The model has a fixed numéraire (consumer) price index, whereas the other prices in the model are real. As was explained above, a numéraire is required since the model is homogenous of degree zero in prices – a doubling of the value of the numéraire would double all prices but leave all real quantities unchanged. Production technology is modelled by a nested CES/Leontief function.

The model specifies a less than perfectly elastic supply. The supply-demand equilibrium is achieved through flexible demand, supply and value added prices. The total response in a regional economy to an exogenous change is not necessarily proportionate, since it depends on the various elasticities of supply and demand. (Partridge & Rickman 1998.) By following Lofgren et al (2002), the basic component and the key features of the model are provided below. The full mathematical model statements can be found in Lofgren et al (2002).

5.3.1 Production

Each activity represents behaviour of a profit maximising producer. The profits are maximised subject to the production technology. The prices of outputs, intermediate inputs and factors are taken as given. The IFPRI model includes the first order conditions for profit-maximisation of producers. The production technology is two-layered. At the top level, where value added and intermediate inputs are combined in order to produce commodities or services, the technology is specified either by a Leontief function or a constant elasticity of substitution function (CES). According to Lofgren et al. (2002) "the CES function is preferable for particular sectors if empirical evidence suggests that available techniques permit the aggregate mix between value-added and intermediate input to vary." In the thesis the model default, i.e. Leontief function, is applied.

Leontief Technology: Demand for Aggregate Value Added

$$QVA_a = iva_a \cdot QA_a \qquad a \in ALEO \qquad (21)$$

Leontief Technology: Demand for Aggregate Intermediate Input

$$QINTA_a = inta_a \cdot QA_a \qquad a \in ALEO \qquad (22)$$

where

$a \in ALEO (\subset A)$ = a set of activities with a Leontief function at the top of the technology net
iva_a = quantity of value added per activity unit
$inta_a$ = quantity of aggregate intermediate input per activity unit

At the bottom level, where value added is formed, the primary factor, i.e. the labour and capital mix is determined by a CES function.

Value Added

$$QVA_a = \alpha_a^{va} \cdot \left(\sum_{f \in F} \alpha_{f\,a}^{va} \cdot QF_{fa}^{-\rho_a^{va}} \right)^{-\frac{1}{\rho_a^{va}}} \qquad a \in A \qquad (23)$$

For each activity, the factors are used up to a point where the marginal revenue product is equal to its wage (that is factor price or rent). These factor wages differ across activities.

Factor Demand

$$WF_f \cdot \overline{WFDIST_{f\,a}} = PVA_a(1 - tva_a) \cdot QVA_a \cdot \left(\sum_{f \in F'} \alpha_{f\,a}^{va} \cdot QF_{fa}^{-\rho_a^{va}} \right)^{-1} \cdot \delta_{f\,a}^{va} \cdot QF_{f\,a}^{-\rho_a^{va}-1} \qquad (24)$$

$$a \in A$$
$$f \in F$$

where

$f \in F\ (F')$ = a set of factors
tva_a = rate of value added tax for activity a
α_a^{va} = efficiency parameter in the CES value added function
$\delta_{f\,a}^{va}$ = CES value added function share parameter for factor f in activity a
QF_{fa} = quantity demanded of factor f from activity a
ρ_a^{va} = CES value added function exponent
WF_f = average price of factor
$\overline{WFDIST_{f\,a}}$ = wage distortion factor for factor f in activity a (exogenous variable)

While value added is a CES function of primary factors, the aggregate intermediate input is a Leontief function of disaggregated intermediate inputs. Figure 6 below illustrates the two-layered production technology.

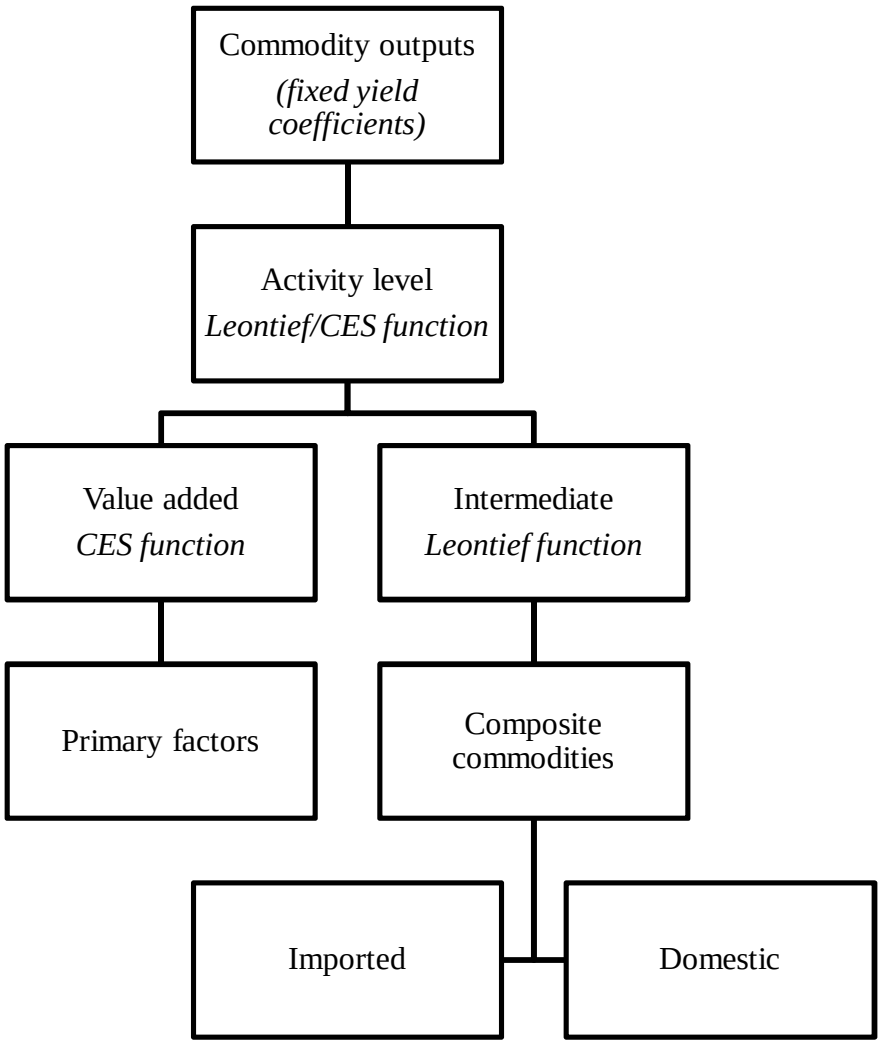


Figure 6. Production technology (Lofgren et al 2002, 9).

5.3.2 Commodities

Figure 7 on page 84 shows the general structure of the commodity markets in the model. Each rural and urban activity produces one or more commodities in fixed proportions. Technically, each industry produces a single commodity that is an aggregate of the products and services produced by this industry. For example, in addition to primary agricultural products, agriculture produces food products, timber, and trade, business and tourist services. Domestic aggregated output is generated from the output of these different activities by using a CES function. An optimisation problem satisfies the choice between commodities from different sources such that the optimal quantity of each commodity from each activity source is inversely related to the activity-specific prices.

Output Aggregation Function

$$QX_c = \alpha_c^{ac} \cdot \left(\sum_{a \in A} \delta_{a\,c}^{ac} \cdot QXAC_{ac}{}^{-\rho_c^{ac}} \right)^{-\frac{1}{\rho_c^{ac}-1}} \qquad c \in CX \qquad (25)$$

where

α_c^{ac} = shift parameter for domestic commodity aggregation function

$\delta_{a\,c}^{ac}$ = share parameter for domestic commodity aggregation function

ρ_c^{ac} = domestic commodity aggregation function exponent

First Order Conditions for Output Aggregation Function: (marginal cost of commodity c from activity a = marginal revenue product of commodity c from activity a)

$$PXAC_{a\,c} = PX_c \cdot QX_c \left(\sum_{a \in A'} \delta_{a\,c}^{ac} \cdot QXAC_{a\,c}^{\rho_c^{ac}} \right)^{-1} \cdot \delta_{a\,c}^{ac} \cdot QXAC_{a\,c}^{-\rho_c^{ac-1}} \qquad (26)$$

$$a \in A$$
$$c \in CX$$

At the next stage, suppliers maximise sales revenues subject to imperfect transformability between the exports and the domestic sales, i.e. subject to a constant elasticity of transformation function (CET). CET determines the ease with which the supply switches between exports and domestic sales. Since the study regions are small compared to the whole of Finland, not to mention global markets, the model assumes that the regions face infinitely elastic import and export demands at given world prices.

Output Transformation (CET) Function (aggregate marketed domestic output = CET[export quantity, domestic sales of domestic output]

$$QX_c = \alpha_c^t \cdot \left(\delta_c^t \cdot QE_c^{\rho_c^t} + (1 - \delta_c^t) \cdot QD_c^{\rho_c^t} \right)^{\frac{1}{\rho_c^t}}, \qquad c \in (CE \cap CD) \qquad (27)$$

The use of Armington's (1969) assumption enables imperfect substitutability between imports and domestic commodities. Therefore, price differences are possible in comparable product categories. The Armington assumption is presented as a constant elasticity of substitution (CES) function that

combines the imports and the domestic output with the composite commodities that represent domestic market demand.

$$QQ_c = \alpha_c^q \cdot \left(\delta_c^q \cdot QM_c^{-\rho_c^q} + \left(1 - \delta_c^q\right) \cdot QD_c^{-\rho_c^q}\right)^{-\frac{1}{\rho_c^q}}, \qquad c \in (CM \cap CD) \qquad (28)$$

where

α_c^q = an Armington function shift parameter
δ_c^q = an Armington fuction share parameter
ρ_c^q = an Armington function exponent

According to Lofgren et al (2002), the assumptions of imperfect transformability between exports and domestic sales, and imperfect substitutability between imports and domestically sold domestic output reflect the empirical realities of most countries better than if a perfect substitutability and transformability had been applied. Moreover, this approach gives the domestic price system a certain independence from international prices. Therefore, the unrealistically strong export and import responses that might follow from economic shocks are prevented.

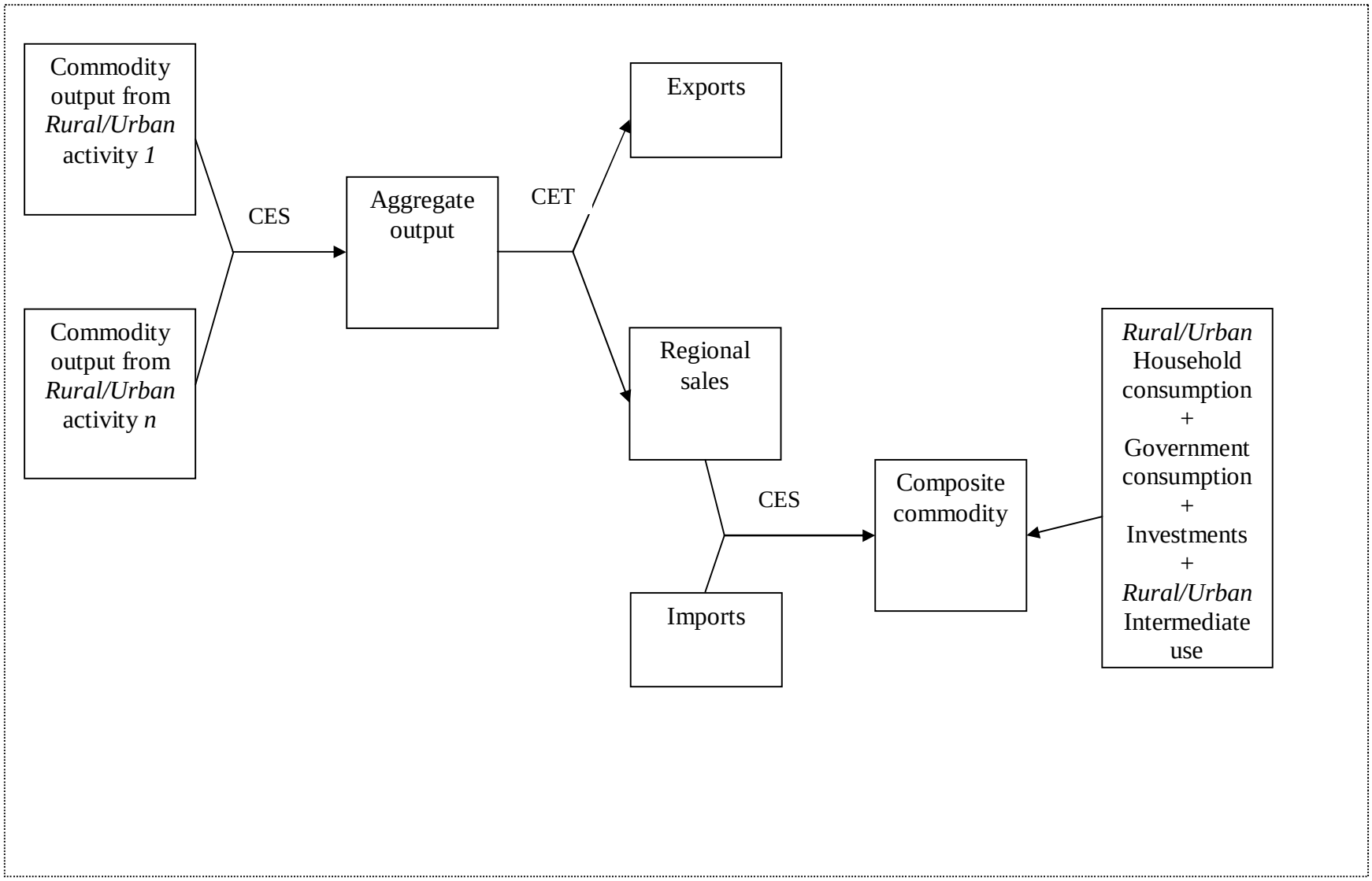


Figure 7. Commodity flows (Lofgren et al 2002, 12).

5.3.3 Institutions

Firms receive capital incomes which they further distribute to the households as factor incomes and to the government as income taxes, the residual covers firms' savings. In my study, the main purpose of a firm's accounts is that through them it is possible to show the payment of the firm's income taxes. (For more detailed discussion of institutions, see Chapter 4.1.3).

Households receive factor income directly from industries (agricultural capital income), through firms' accounts and from the rest of the world. In addition, the government pays income transfers to households. Households consume marketed commodities, save, pay taxes and transfer money to other institutions, such as trade unions and the church. Household consumption is allocated across the different commodities according to the linear expenditure system (LES) demand functions, derived from the maximisation of a Stone-Geary utility function (Lofgren et al. 2002, 10). The LES is a generalisation of Cobb-Douglas function (which is homothetic). However, it has an additional feature that an additional income does not necessarily increase consumption of every good proportionately (i.e. nonhomotheticity). (Partridge & Rickman 1998, 212.)

Income of Domestic, Nongovernment Institutions

$$YI_i = \sum_{f \in F} YIF_{i\,f} + \sum_{i' \in INSDNG'} TRII_{i\,i'} + trnsfr_{i\,gov} \cdot \overline{CPI} + trnsfr_{i\,row} \cdot EXR, \qquad i \in INSDNG \tag{29}$$

where

$i \in INSDNG\ (= INSDNG' \subset INSD)$ = a set of domestic nongovernment institutions
YI_i = income of institution i (in the set INSDNG)
$TRII_{ii'}$ = transfers from institution i' to i (both in the set INSDNG)

Local government collects taxes from local activities and institutions, and receives transfers through the rest of the world account. The external transfers come from other institutions, for example the Finnish central government and the pension institutions. In the basic model, the taxes are fixed at ad valorem rates. The government purchases commodities, pays income transfers to the households and saves.

The rest of the world account includes foreign savings (or the current account deficit) i.e. the difference between spending and receipts by the rest of the world account. However, the

interpretation of, for example, foreign savings on a regional economy is not entirely comparable to the interpretation of a national economy (see for example Dow 1986).

In conclusion, the openness of the regional economy affects and generates complications in regional CGE modelling. For instance, a major share of trade flows occur between other regions, and only a minority between other countries. In addition, not only the savings of the region's residents but also the foreign savings from the other regions generate and influence investments. Further, labour is more mobile between regions than between countries. And finally, there is interaction between regional and national levels of government concerning taxes, transfers and expenditures. (Partridge & Rickman 1998; Doi 2006.)

5.3.4 Macroeconomic balances

The standard model includes three macroeconomic balances: the government balance, the external balance, i.e. the current account of the balance of payments (including the trade balance), and the savings investments balance. The choices of different macroeconomic balances typically influence the results of the simulations, yet leave the base year solution unchanged. The choices of the closure rules should reflect the empirical situation of the particular research area. The different closure options are presented in Table 26 below, in which the chosen closure rules (for most of the simulations) are printed in bold letters. The choices are justified below.

Table 26. Alternative closure rules for macroeconomic constraints (Lofgren et al 2002, 13).

Constraints			
Government	**Rest of the World**	**Savings-Investments**	
GOV-1 **Flexible savings; fixed direct tax rates**	***ROW-1*** Fixed foreign savings; flexible real exchange rate	***SI-1*** Fixed capital formation; uniform MPS point change for selected institutions	***SI-4*** Fixed investment and government consumption absorption shares (flexible quantities); uniform MPS point change for selected institutions
GOV-2 Fixed government savings; uniform direct tax rate point change for selected institutions	***ROW-2*** **Flexible foreign savings; fixed real exchange rate**	***SI-2*** Fixed capital formation; scaled MPS for selected institutions	***SI-5*** Fixed investment and government consumption absorption shares (flexible quantities); scaled MPS for selected institutions
GOV-3 Fixed government savings; scaled direct tax rates for selected institutions		***SI-3*** **Flexible capital formation; fixed MPS for all non government institutions**	

Lofgren (2002) reviews different types of commonly applied macroclosures and compares their characteristics. Johansen closure, which combines fixed foreign savings, fixed real investments and any of the government closures, may be preferable, yet not unambiguously, for the simulations that explore the equilibrium welfare changes of the alternative policies. However, this recommendation applies primarily to nationwide models. Neoclassical closure, which is often used in applied work, applies the rule of savings-driven (SI3) investments. Under this rule, investments are determined by the sum of private, government and foreign savings. Lofgren also introduces "balanced closures" (SI4 and SI5), which allow the tree components of absorption to adjust simultaneously, thus mimicking the real world.

The closures depicted in Table 26, however, do not assume a link between macrovariables and aggregate employment. Therefore, it is possible to specify an additional Keynesian closure that links employment and the macrovariables. However, the exact definitions of a Keynesian closure (and of other closures) differ in different sources. For example, in Taylor's (1990) structuralistic macromodel, investment is fixed in real terms, and in the labour market the real wage is flexible in a setting with unemployment.

Harrigan and McGregor (1989) in their study on "Neoclassical and Keynesian perspectives on regional macro-economy" applied several different variations of macroeconomic closures. They concluded that there is no single set of closure rules that could be applied generally, rather the appropriate closure depends upon the economy being studied, and the assumed time horizon. They also stressed that the macroeconomic behaviour of a regional economy may differ quite radically compared with the standard macroeconomic models of national economies.

Rattsø (1982) analyses the discussion on macroclosures relating to macroeconomic controversies, referring to Amartya Sen's discussions (1963) on the differences between neoclassical, neo-Keynesian, Johansen and general theory approaches to macro theories of income distribution, and Taylor's and Lysy's (1979) study on income distribution, and concludes that the closing of the model largely determines the model's qualitative characteristics. Therefore, the applied closure rules aim at reflecting, as accurately as possible, the empirical situation of the study regions.

In Finland, taxation decisions are made either on the government level or on the municipality level, not at the regional level. In the model, the information on the taxes paid by each institution is based on the total sum drawn from the sources of Statistics Finland and the Finnish tax authorities. This sum is distributed from the regional total to the different household and firm types. However, regarding the urban areas of Joensuu and Seinäjoki, since they are independent municipalities, the total sum of collected taxes was available. Thus, based on the economic and the administrative positions of the regions, it was reasonable to choose a government closure that leaves all tax rates fixed but enabled government saving (the difference between current government revenues and current government expenditures) to change, instead of letting the direct tax rates of domestic institutions adjust in order to generate a fixed level of government savings.

The chosen ROW-2 closure implies that the real exchange rate is fixed (indexed to the model numéraire), whereas foreign savings and the trade balance are flexible. This reflects a situation of a small open economy that faces an infinitely flexible demand. It is justified to classify regional economies as small open economies. In addition, most of the imports and exports of these regions are from, or they go to, other parts of Finland. In addition, both the regions are dependent on transfers and investments from other parts of the country.

Regarding the Savings-Investment balance, the available closures are either investment-driven, which means that the value of savings adjusts, or savings-driven which means that the value of

investments adjusts. The chosen SI-3 is savings-driven. Under this rule, in order to ensure that the investment cost equals the savings value, the quantity of each commodity in the investment bundle is multiplied by a flexible scalar. All nongovernment savings rates are fixed.

In this study, the simulations are carried out under a Keynesian closure, which allows the labour supply to vary freely but assumes that the factor price of labour is fixed. In contrast, if Neoclassical closure were applied, the labour factor prices would clear the labour market such that the wages would adjust while the labour supply would be fixed. The choice of a Keynesian closure for the closure applied in this research is based on the empirical issues of the study areas. North Karelia has suffered high unemployment compared to the national level. However, unemployment has not been a particular problem for South Ostrobothnia. Another argument supporting the use of a Keynesian closure is that in Finland, there has been a strong corporative system, where wages and conditions of employment have been negotiated between the nationwide trade unions and the employers organisation and to a large extent also the Finnish government. However, lately this system has shown marks of disintegration in that the Finnish government has withdrawn, and to a larger extent, wages are negotiated at the trade union and employer organisation, or at the firm level.

5.3.5 Parameterisation

The social accounting matrices are used, not only as the base year data for the CGE model, but also in order to calibrate the coefficients of the model equations together with production, trade and consumption elasticities. According to Devarajan & Robinson (2002), there are two different groups of parameters that need to be estimated for the CGE models. The first group consists of the share parameters such as intermediate input costs, consumer expenditure shares, average savings rates, import and export shares, government expenditure shares, and average tax rates. These are endogenous parameters that are estimated by using the information available in the base year SAM. For example, from value added (equation 23 on page 80) and factor demand (equation 24 on page 80) functions, the efficiency parameter in the CES value added function, and the CES value added function share parameter for factor f in activity a (α_a^{va}, $\delta_{f\,a}^{va}$) can be estimated directly from the SAM.

The second group of parameters are the elasticity parameters that describe the curvature of structural functions. The Constant Elasticity of Substitution function requires specification of the elasticities. The elasticities presented below (Table 27) were drawn from different sources. The production elasticities, except the output aggregation elasticity that was drawn from the model's default, are based on previous Finnish research (Törmä & Rutherford 1992; Törmä et al. 1995; Vaittinen 2004; Törmä 2006), and the household income elasticites are based on the information from the US Economic Research Service. However, more recently Honkatukia et al. (2009) have estimated the LES consumption function for eight socioeconomic groups. They reported slightly higher figures for agricultural (0.8) and for transportation services (0.5), and a lower figure for food products (0.7). Notwithstanding, the initial figures (Table 27) were applied in all the simulations in this study.

A number of previous studies (see Bilgic et al. 2002) suggest that elasticities of substitution for regional trade should be higher than those applied in the international trade studies. Partridge and Rickman (1998) justify this by explaining that regions face lower barriers to trade than nations because they are geographically closer to each other. However, Bilgic et al (2002) did not find evidence to support this hypothesis. In effect, they suggest that instead of using the regional elasticity of import substitution parameters in the often applied range of 2.0 to 3.5, the parameter values from 0.45 to 2.80 would be more preferable in that the more specialised the products, the lower the elasticity value. In this study an overall value of 2 is applied for all the products. This represents a middle range of values. In Finnish research e.g. Törmä and Lehtonen (2009) have applied 4.00 for both Armington elasticity and transformation elasticity, and Vaittinen (2004) as high as 8. Therefore, in order to test the possible effects of various elasticity values in my thesis, both the lower and the higher values for the trade elasticities were experimented with during the sensitivity analysis (Appendix 4).

Given elasticities of substitution and the expenditure shares of the SAM, the parameters of the CES could be solved for in order to reproduce the benchmark year data.

Table 27. Elasticity values

Production elasticities					
Elasticity of substitution between factors -bottom of the technology nest					
Primary production		Manufacturing		Services	
Agriculture	0.5	Food industry	0.8	Trade	0.6
Forestry	0.4	Textile industry	0.9	Hotels and catering	0.6
Fishery	0.4	Wood processing	0.7	Transport	0.3
Mining	0.8	Paper industry	0.7	Financing	0.6
		Fuels	0.5	Business services	0.6
		Minerals	0.5	Estates	0.6
		Metal industry	0.5	Public services	0.8
		Machinery	0.7	Education	0.8
		Electronic equipment	0.8	Health services	0.8
		Transport equipment	0.8	Other (private) services	0.8
		Other manufacture	1.05		
		Energy	1.2		
		Construction	0.7		
(Elasticity of substitution between aggregated factors and intermediate inputs -top of the technology nest					
All industries	0.1)				
Output aggregation elasticity for commodity C					
All commodities	6.0				
Trade elasticities					
Armington elasticity by commodity (imports)					
All industries	2.0				
CET elasticity by commodity (exports)					
All industries	2.0				
Household consumption elasticities					
Frisch parameter for household LES demand					
All households	-1.0				
Expenditure elasticity of market demand for commodity c by household h					
Primary goods		Manufactured goods		Services	
Agriculture products	0.4	Food products	0.4	Trade	1.3
Forestry products	0.4	Textiles	1.0	Hotels and catering	1.3
Fish products	0.4	Timber	1.2	Transport	1.2
Mining products	1.0	Paper products	1.3	Financing	1.2
		Fuels	1.2	Business services	1.3
		Minerals	1.2	Estates	1.2
		Metals	1.2	Public services	1.2
		Machinery	1.3	Education	1.0
		Electronic equipment	1.3	Health services	1.2
		Transport equipment	1.3	Other (private) services	1.3
		Other manufactured products	1.2		
		Energy	1.2		
		Construction	1.2		

5.3.6 Pros and cons of the chosen approach

CGE modelling offers several good characteristics for policy analysis. Hertel (2002) points out especially that the focus of these models is on people, services and resources. Thus, CGE analysis is able to put and consider things in an economy-wide perspective from several different positions. An additional useful feature is that welfare can be computed directly in terms of household utility instead of the abstract summation of producer, consumer and taxpayer surpluses. In addition, CGE models meet the requirements of microeconomic theory by emphasising the importance of relative, rather than absolute, levels of economic variables.

According to Devarajan and Robinson (2002) a CGE framework is an illustrative tool for experimenting with different policy and economic shocks since it reveals underlying structural relations and indirect links. This ability to reveal the effects of backward and forward linkages is the main virtue of these models. A feature that critics of CGE modelling often point to, is that the results attained from the CGE models are not econometrically estimated and therefore cannot be subjected to the usual forecasting tests. However, Hertell (2002) defends the reliability of the results if the following terms are obtained: 1) the individual components of the system are based on plausible, perhaps even econometrically estimated, relationships, 2) the underlying social accounting matrix is accurate and reflects the best economy-wide data available, and c) the equilibrium assumptions and the macro-closures are plausible.

These prerequisites are sufficiently fulfilled in this study since the data used can be considered accurate, and since the main part of the information was not derived from the national level (as is often the case when building regional SAMs). Instead, the main part of the material was collected from the regional or even from the municipality level. In addition, both the regional input-output tables and the SAMs constructed for this study also relied on survey-based, region-specific material. Further, the macroclosures were chosen to reflect the predominant economic situation of these particular regions. Partridge and Rickman (1998, 2010) provide thorough overviews on the (regional) CGE modelling approaches.

Imperfect competition would be an important feature for a model researching agglomeration and location. There are various alternative approaches to apply imperfect competition in the general equilibrium analyses. The key constraint seems to be the availability of high quality data to support

the calibration of markups, excess profits, and scale economies. Francois and Roland-Holst (1997) offer a survey on this topic. Currently, dynamic CGE modelling is commonly applied for regional analysis (see for example Partridge & Rickman 2010). The main focus of these studies, however, is on modelling technical changes and capital accumulation, and producing policy scenarios reaching further into the future (compared with static models). Recently, more advanced techniques, such as dynamic stochastic general equilibrium (DSGE) modelling (see for example Rickman 2010) have been introduced to overcome the deficiencies of the previous approaches. At their best, these models combine the best qualities of partial equilibrium models and CGE models.

As for the NEG tradition, the CGE model used in this research does not present scale economies and thus is unable to explain why agglomeration or dispersion happens, instead it concentrates on finding out if it occurs. In this way my thesis concentrates on the consequences of the chosen policy targets or measures. The applied perfect competition model rather follows Isard's (1956) tradition of the general theory of location and space economy.

The drawbacks of the applied model are related to the absent aspects referred to above, for example the lack of economies of scale and dynamics. However, there is always a trade-off between the additional features and the clarity of the causal mechanisms of the model. Devarajan and Robinson (2002) have pointed out that as more details and complexity are included, the greater the danger of the so-called black box syndrome. On the other hand, simple models, despite their undeniable deficiencies, might be more useful for interpreting and comparing different policy outcomes. Therefore, recommendation (e.g. Devarajan and Robinson 2002) to apply Occam's Razor i.e. using the simplest model adequate to the task at hand, is applied in this study.

6 Agricultural policy simulations

6.1 Introduction

Both the regional and agricultural policies of the European Union are reconsidered for the new EU programming period, which begins in 2014. Future policies face tightening EU budget constraints and, in addition, the EU agricultural policy is expected to further comply with WTO commitments and free trade pressures. Regarding both regional and agricultural policies, the underlying denominators for future policy objectives are sustainability, competitiveness, and social and economic cohesion.

Assembly for European Regions (2010) calls for coordination between the EU funds so that the objectives and means of the rural development and the cohesion policies would be more coherent. The incorporation of territorial perspectives into future policies would contribute to the emergence of better targeted policies. These, in turn, would help ensure that the territorial strengths and potentials would be efficiently utilised, and that the support and assistance would better respond to local needs. EU Commission (2010), for one, stresses that the CAP reform must continue so that it would further promote competitiveness and the efficient use of taxpayers' resources. In addition, it should bring policy returns for European citizens. However, the ability of the CAP as a promoter of EU regional cohesion has been criticised (e.g. Shucksmith, Thomson & Roberts 2005; Esposti 2007).

Recently, the regional and territorial impacts of the CAP have been closely analysed. For instance, Rizov (2004) concluded that the redistribution of the CAP support clearly impacted on rural development and household welfare. Shucksmith et al. (2005), in turn, argued that the CAP has uneven territorial effects especially in terms of its first pillar. However, they admitted that the second pillar, at least in some cases, may be more consistent with cohesion targets. Esposti (2007) found that CAP expenditure had no counter treatment effect, and that its positive impact on growth is marginal. Daniel and Kilkenny (2009) concluded that both coupled subsidies and single farm payments decrease spatial agglomeration. Nevertheless, only the single farm payment policy raised welfare in both rural and urban regions.

More generally, from the point of view of agricultural policy modelling, various different models have been used to examine the impacts of agricultural policies in the European Union. For example, Balkhausen et al. (2008) provide an overview of the EU-wide models studying the impacts of CAP decoupling, and Moss et al. (2006) review several partial equilibrium and CGE models used for a range of agricultural policy analyses. In addition, there are various farm sector models for investigating the different policy regimes of the EU, e.g. Guyomard et al. (2004) and Lehtonen (2001) in Finland.

In Agenda 2000 reform, the Commission launched a new model of European agriculture that is based on two pillars. The first pillar contains the traditional price and market policy, and the second pillar a policy component for rural areas and the environment. It further introduced voluntary modulation, which enabled member states to transfer funds from the first pillar to the second pillar. Since the member states utilised this option only marginally, an obligatory modulation was introduced in the Fishler reform, and it took effect from 2005 onwards. The major targets for the CAP second pillar and the EAFRD (European Agricultural Fund for Rural Development) for the period 2007-2013 are a) improving the competitiveness of agriculture and forestry, b) improving the environment and the countryside and c) improving the quality of life in rural areas, and enhancing diversification of rural economies e), and LEADER initiatives (EU Official Journal 2005). Concerning the future prospects of the CAP second pillar, Burrell (2009) argues that there appears to be a clear commitment of further strengthening it among policy makers. In addition, according to Esposti (2007), the second pillar should contain less sectoral and more economy-wide measures that would be explicitly designed to combine with structural policies at the regional or at the local level.

It is a common argument that farms are key actors in preserving rural livelihood. Since farms have become more efficient and thus need less work per output, the possible future direction could be the diversification of the farm activities. Agriculture ties people down to remote areas, and farm diversification could bring additional employment, economic activity and customers to these areas. Therefore, farm diversification might be an expedient to maintain family farm structure and still be able to increase productivity through improved factor efficiency.

However, because of the variety of the problems, types and characteristics of the rural areas within the European Community, a selective, area-specific approach to diversification is preferable. Whitby (1991, 158) argues that the regions should aim at attracting industries capable of building strong local linkages (e.g., food processing industries) or for which there is an increasing local

demand (e.g. health and recreation services). The importance of service sectors for rural areas is highlighted, for example, by Bryden and Bollman (2000) and Rizov (2004). On the other hand, many regional analysists argue that there is a clear relation between a region's exports and its overall growth. The export base theory of growth states that the growth of a region specifically depends on the growth of its export industries (see for example Richardson 1976).

This chapter concerns CAP modulation in the regional development framework in a way that the natural handicap payments (LFA) and the Environmental Scheme, that in practice take the lion share of the CAP second pillar in Finland, are not the objects of the analysis. It should be borne in mind that simulations do not aim at reflecting the exact sums or shares of modulation funds, rather modulation simulations reflect the principle of modulation: the transference of funds from the CAP first pillar, i.e. direct payments to the CAP second pillar, i.e. rural development.

The modulation is simulated in two different ways. The first approach maintains the subsidies inside the agricultural activity through farm diversification. Due to the strong structural change of Finnish agriculture during EU membership, other farm related economic activities, in addition to the traditional agriculture, have become increasingly important for farms and for rural areas in Finland. Finnish research on farm diversification, however, concentrates on the fields of sociology and business economics and management (Niemelä, Heikkilä & Meriläinen 2005; Rantamäki-Lahtinen 2002, 2009; Rantamäki-Lahtinen et al. 2008; Vesala, K.M. 2005; Vihinen & Vesala 2007). Hence, my thesis offers a new perspective on research into farm diversification in Finland by linking the diversified activity to the overall regional economy by exploiting SAM multiplier and general equilibrium models. The first simulation aims at exploring whether diversified agriculture has potential for backing up regional economic development.

The second approach transfers subsidy cuts to regional investments so that support is not channelled to a specific activity or area. The first investment simulation channels funds into an increased investment demand for business and trade services and electronic equipment. This simulation aims at reflecting the policy targets of promoting know-how and business and marketing skills. The second channels funds so that demand for construction and machinery investments is increased in both the regions. In addition, one third of the modulation funds is channelled into increased demand for extraction goods in North Karelia, and for timber in South Ostrobothnia. This distinction follows the regionally defined sector emphases.

6.2 Simulations

In order to simulate the subsidy transfer from agriculture to other farm activities, an additional farm-related activity was included in the SAMs. Because the total output of these diversified activities on the regional level is relatively small, not all the different industries or activities that the diversified farms are engaged in were included as such. Instead, a representative diversified activity was constructed so that in South Ostrobothnia, the activity consists of 26% of food manufacturing, 6% of trade, 17% of tourist services and 50% of business services. The corresponding structure in North Karelia is 19% of food manufacturing, 6% of trade, 19% of tourist services and 56% of business services. These shares and the activities reflect the actual farm accounting data collected from South Ostrobothnia and North Karelia so that the shares of manufacturing and services are equivalent, and the most important activities are included. The structures of the production processes were differentiated and the inputs and the input shares of the diversified activities differ from those of actual agriculture. Accordingly, each of the industries included in the representative diversified industry has an individual input structure, productivity per employer and share of capital incomes. These figures and shares were derived from the corresponding local rural activities. However, since these rural activities are an aggregate of all the firms i.e. both large and small firms, it was necessary to presume that the productivity of these often very small farm-related enterprises were below the equivalent industries' averages. In the end, the figures were cross examined with the figures attained from the farm accounting information concerning diversified farms.

The 2005 farm accounting (TIKE 2006) provided information on the working hours used for other activities at the regional level. These working hours were transformed into man-years. Further, the shares of wages and capital incomes were counted by using the information collected for the SAMs concerning the numbers of entrepreneurs and employees working for agriculture. Finally, the share of the output of the diversified farms of the original agricultural activity account output was 21% in South Ostrobothnia and 13% in North Karelia. In the model, it is presumed that diversified activities are 25% more efficient than traditional agriculture measured in terms of output per working hour. However, the average efficiency of the corresponding rural activities, i.e. food manufacturing, trade, tourism and business services was much higher than this 25% compared to traditional agriculture. "Diversified activity" wages are channelled to several household types, while all the capital income is channelled to the agricultural households. The agricultural land factor and the related factor incomes were left under the agricultural activity.

Three different simulations were carried out. All of them aim at reflecting the so called modulation from the CAP first Pillar direct payments to the rural development measures of the CAP second Pillar. Regarding all the three simulations, 30% of the total regional agricultural subsidies were cut and transferred. Among other things, Table 28 presents the base year values and the simulation values of subsidies and the parameter *ta*, which is a share of the industry's activity tax of the industry's gross output value. The total agricultural subsidy (subsidy is allocated to the activity tax account as a negative receipt, whereas activity taxes are there as positive receipts) in South Ostrobothnia was 192.6 million EUR, and thus the 30% cut amounted to 57.8 million EUR. Similarly in North Karelia, the agricultural subsidy was 70.8 million EUR, and the corresponding 30% cut was 21.24 million EUR.

Table 28. Base and simulation values of output, subsidy, tax and parameter *ta*.

	Agriculture, SO	Diversified, SO	Agriculture, NK	Diversified, NK
Output, mill EUR	383.418	102.330	144.284	21.294
Subsidy base, mill EUR	-192.600	-5.116	-70.800	-1.491
Tax base, mill EUR	42.513	4.454	19.891	1.519
Atax base, mill EUR	-150.087	-0.663	-50.909	0.028
ta0	-0.391	-0.006	-0.353	0.001
Subsidy cut, mill EUR	-57.780		-21.240	
Atax sim, mill EUR	-92.307	-58.443	-29.669	-21.212
ta sim	-0.241	-0.571	-0.206	-0.996

In practice, the policy simulations adjust the activity tax rate on the activity output such that *TASIM(A,SIM)=TA0(A)*; in which *TASIM(A,SIM)* is a rate of the activity tax or subsidy by activity by simulation, and *ta0(A)* is a share of activity tax on the producer gross output value. In the diversified farm simulation, the subsidy is transferred to the diversified activity as an income subsidy, whereas concerning the investment simulations the corresponding sum is transferred to increased investment demand. The "Modern investment" simulation allocates the funds to the increased investment demand for the investments of business services, electronic equipment and trade services, each of which having equal shares. Similarly, the "Traditional investment" simulation distributes the funds to the investment demand for construction, machinery and timber/extraction goods. Table 29 illustrates the impacts of the simulations on the investment demand for the simulated investment goods. For comparison, the figures in brackets show the

changes in the goods whose demand has not been exogenously increased in that particular simulation.

Table 29. Quantity of investment demand, million EUR.

	South Ostrobothnia				North Karelia			
	SAM value	QINV Base	Modern	Traditional	SAM value	QINV Base	Modern	Traditional
C-mining	2.46				1.86	1.83	*(2.00)*	13.14
C-timber	-1.05	-0.88		33.59	-1.58			
C-mach	58.87	54.24	*(59.17)*	95.54	59.66	56.5	*(61.84)*	74.43
C-eeq	82.34	76.97	117.54	*(86.51)*	83.96	79.26	97.57	*(88.85)*
C-constr	402.93	379.62	*(414.14)*	461.24	325.24	311.15	*(340.55)*	359.89
C-trade	10.61	9.52	43.95	*(10.7)*	10.67	9.52	21.25	*(10.67)*
C-busserv	102.57	100.57	143.28	*(113.03)*	92.51	90.83	110.23	*(101.82)*

The simulations were conducted as follows: *AGPAYSIM1(SIM)* is an exogenous transfer that increases demand for the investment of business services such that *AGPAYSIM1(SIM)=qbarinv('C-busserv')*, where *qbarinv(C)* is an exogenous (unscaled) investment demand[1].

6.3 Results

The macroeconomic impacts of the modulation shocks at the regional economies of South Ostrobothnia and North Karelia are presented in Table 30. The first column shows the base values in millions EUR derived from the Social Accounting Matrices. The second column presents the percentage changes from the base values caused by a 30% cut in agricultural subsidy, and the corresponding money transfer to the diversified activities. Similarly, the third and fourth columns show the effects of a 30% agricultural subsidy cut and transfer to increased investment demand.

[1] The equations determining the investment demand in the model are provided in Appendix 3

Table 30. Macroeconomic indicators.

South Ostrobothnia	BASE mill EUR	Diversified farms, %ch	Modern investment, %ch	Traditional investment, %ch
Private Consumption	2448.79	-0.01	-1.06	-0.45
Investments	718.55	1.28	24.06	28.49
Exports	2442.42	-0.11	-0.6	-0.59
Imports	2534.21	0.12	3.98	4.73
GDP at Factor Costs	3424.46	-0.02	0.51	1.04
North Karelia	BASE mill EUR	Diversified farms, %ch	Modern investment, %ch	Traditional investment, %ch
Private Consumption	2036.25	-0.01	-0.41	-0.25
Investments	630.52	1.39	11.03	13.93
Exports	1888.51	-0.07	-0.38	-0.47
Imports	2047.64	0.24	2.06	2.72
GDP at Factor Costs	2931.69	0.02	0.23	0.4

The changes go into the same direction in both of the regions apart from the total GDP effect under the diversified simulation. However, the degrees of the changes varied. At least two factors should be noticed when interpreting these results, i.e. the importance of agriculture and food industries in the regional level, and the size of the money transfers. The transfer measured in EUR was more than twice as large in South Ostrobothnia compared with North Karelia. In addition, if one compares these sums with the regional GDPs, their shares were very small: 0.007 % in North Karelia and 0.017% in South Ostrobothnia. The share of agriculture of the regional GDP was 4% in North Karelia and 9.3% in South Ostrobothnia. When the food industries (both rural and urban) were also accounted for, the corresponding percentages were 15.5 for South Ostrobothnia and 5.3 for North Karelia.

The traditional investment transfer boosted regional investments most in both of the regions. The diversified simulation also resulted in positive changes in investments. Imports increased while exports and private consumption slightly decreased. The indicators presented in Table 30 are further detailed and explained below. In addition to the rural and urban totals, the aggregate figures of rural primary, rural and urban manufacturing and rural and urban services sectors were counted. The subsidy transfer benefited not only the diversified farms but also both rural and urban aggregate

manufacturing. In North Karelia, services also gained. As for the investment simulations, Traditional investment resulted in greater total gains and especially the value added of manufacturing, but also of services, increased. Spatially, the urban area earned a higher GDP increase compared with the rural area in all the simulations. Rural GDPs and value added of agriculture and food industries decreased, whereas the value added of diversified farm activity increased.

Table 31. Regional GDP at factor costs.

South Ostrobothnia	BASE mill EUR	Diversified farms, %ch	Modern investment, %ch	Traditional investment, %ch
GDP total area	3424.46	-0.02	0.51	1.04
Rural area	2587.25	-0.04	0.39	0.99
Primary	460.4	-0.42	-1.15	-1.12
Secondary	796.64	0.13	0.92	3.57
Tertiary	1330.21	0.00	0.62	0.17
Urban area	837.21	0.05	0.85	1.18
Primary	15.22	0.00	0.00	0.07
Secondary	182.86	0.21	1.61	4.74
Tertiary	639.13	0.00	0.65	0.19
Diversified' activity	66.19	5.21	0.05	0.04
Agriculture	253.33	-2.13	-2.14	-2.12
Food industry, rural	157.79	-0.29	-1.20	-1.25
North Karelia	BASE mill EUR	Diversified farms, %ch	Modern investment, %ch	Traditional investment, %ch
GDP total area	2931.7	0.02	0.22	0.39
Rural area	1724	-0.01	0.13	0.36
Primary	348.8	-0.33	-0.83	-0.60
Secondary	523.8	0.16	0.62	1.40
Tertiary	858.5	0.02	0.22	0.11
Urban area	1207.7	0.05	0.35	0.45
Secondary	321.9	0.14	0.53	1.28
Tertiary	885.8	0.02	0.29	0.15
Diversified' activity	13.15	13.30	0.04	0.04
Agriculture	104.4	-2.74	-2.72	-2.72
Food industry, rural	24.52	-0.28	-1.60	-1.64

Table 32 shows the employment and capital rent effects. Since the labour market was integrated for the simulations, employment differences between the rural and urban areas are not reported. Employment increased under both of the investment simulations so that Traditional generated higher employment effects and, in addition, blue collar employment increased more. Investment simulations resulted in relatively more jobs in South Ostrobothia compared with North Karelia. With the Diversified farm simulation, the positive employment effect was stronger in North Karelia. Since agriculture in Finland is predominantly based on family farms and small entrepreneurship (not limited companies), the major income effects on agricultural households came through capital incomes rather than wages. Agricultural land rents fell drastically, while the drop in agricultural capital rents was steadier, and even positive in South Ostrobothnia.

Table 32. Employment and rent effects, %ch.

South Ostrobothnia	Diversified farms	Modern investment	Traditional investment
Employment			
White collar	0.07	1.03	1.87
Blue collar	0.07	1.05	2.29
Factor rents			
Rural Capital	0.1	2.13	3.73
Agricultural Land	-25.33	-25.41	-25.22
Agricultural Capital	4	-19.11	-18.98
Urban Capital	0.12	2.62	3.44
North Karelia	Diversified farms, %ch	Modern investment, %ch	Traditional investment, %ch
Employment			
White collar	0.1	0.47	0.67
Blue collar	0.12	0.42	0.84
Factor rents			
Rural Capital	0.97	0.44	0.64
Agricultural Land	-24.01	-23.85	-23.82
Agricultural Capital	-4.25	-21.73	-21.69
Urban Capital	0.09	0.87	0.69

Both domestic sales and imports of aggregate products and services increased as a result of all the simulations, though sales and imports of secondary sectors' products increased the most. Simultaneously, exports decreased. In contrast, domestic sales, exports and imports of food

products decreased due to the simulations. The food industry is export oriented in South Ostrobothnia, accounting for 33% of the total export incomes of the region, whereas North Karelia is a net importer of food products. (Table 33)

Table 33. Domestic sales, exports and imports, %ch.

South Ostrobothnia	BASE mill EUR	Diversified farms	Modern investment	Traditional investment
Quantity of domestic sales				
All products	4563.70	0.05	1.12	2.43
Primary	541.9	-0.47	-1.13	-0.73
Secondary	972.4	0.46	3.45	10.87
Tertiary	3049.4	0.01	0.78	0.31
Agri products	424.17	-0.61	-1.52	-1.52
Food products	174.23	-0.27	-1.06	-1.02
Quantity of exports				
All products	2442.40	-0.11	-0.60	-0.59
Primary	168.7	-0.40	-1.20	-2.37
Secondary	2120.5	-0.10	-0.56	-0.47
Tertiary	153.2	0.01	-0.56	-0.44
Agri products	57.34	-1.08	-3.05	-2.94
Food products	808.78	-0.29	-1.22	-1.29
Quantity of imports				
All products	2534.20	0.12	3.98	4.73
Primary	97.7	-0.01	0.48	2.90
Secondary	1587.3	0.15	3.39	6.16
Tertiary	849.3	0.09	5.47	2.27
Agri products	50.50	-0.14	0.04	-0.06
Food products	286.86	-0.25	-0.88	-0.74
North Karelia	BASE mill EUR	Diversified farms	Modern investment	Traditional investment
Quantity of domestic sales				
All products	3782.7	0.11	0.65	1.17
Primary	310.2	-0.27	-0.65	0.26
Secondary	782.1	0.54	2.26	4.88
Tertiary	2690.5	0.03	0.33	0.19
Agri products	115.32	-0.75	-1.85	-1.86
Food products	45.66	-0.21	-1.13	-1.13
Quantity of exports				
All products	1888.5	-0.06	-0.38	-0.46
Primary	165.4	-0.33	-1.13	-1.52
Secondary	1554.2	-0.04	-0.30	-0.37
Tertiary	168.8	-0.01	-0.37	-0.26
Agri products	48.86	-1.10	-3.68	-3.65
Food products	150.15	-0.28	-1.73	-1.79

Quantity of imports				
All products	2047.7	0.23	2.06	2.72
Primary	84.5	-0.02	0.31	10.39
Secondary	1269.1	0.27	1.92	2.93
Tertiary	694.1	0.20	2.51	1.41
Agri products	22.91	-0.41	0.02	-0.03
Food products	180.37	-0.14	-0.52	-0.46

Both foreign and government savings increased (Table 34). In the model, the Current-Account Balance for the rest of the world equation is:

$$\sum_{c \in CM} pwm_c \cdot QM_c + \sum_{f \in F} trnsfr_{row\ f} = \sum_{c \in CE} pwe_c \cdot QE_c + \sum_{i \in INSD} trnsfr_{i\ row} + \overline{FSAV} \quad (30)$$

[import spending + factor transfers from RoW = export revenue + institutional transfers from RoW + foreign savings].

Since the exchange rate was fixed in the simulation, and imports increased and exports decreased, the increase in foreign saving can be interpreted as increasing "foreign" investments. Correspondingly, the government balance imposes equality between current government revenue and the sum of current government expenditures and savings.

Table 34. Foreign and government savings, %ch.

South Ostrobothnia	BASE mill EUR	Diversified farms	Modern investment	Traditional investment
Foreign savings	213.05	2.73	54.22	63.08
Government savings	86.53	5.12	80.71	115.36
North Karelia	BASE mill EUR	Diversified farms	Modern investment	Traditional investment
Foreign savings	164.78	3.68	29.87	39.17
Government savings	82.04	1.78	29.62	34.96

At the aggregate level, both producer and consumer prices increased (Table 35). The directions of the total value added prices, however, varied in the different regions.[2] The value added price of agriculture decreased in all the simulations in both of the regions by around 20%. The most important factor was the falling value of agricultural assets. The corresponding decrease for the

[2] An example of the equation of the value added price in the CGE model is provided in Appendix 3.

food industries were 0.2–1.3%. By contrast, the producer and consumer prices of agriculture and food products slightly increased in all the simulations. This is reasonable, since the supply of agricultural products decreased.

Table 35. Price changes, %ch.

South Ostrobothnia	Diversified farms	Modern investment	Traditional investment
Price of Value Added	1.11	0.07	0.35
Agriculture	-22.04	-22.11	-21.95
Food industry, rural	-0.31	-1.27	-1.32
Producer price	0.03	0.55	1.4
Agri products	0.24	0.79	0.74
Food products	0.01	0.09	0.14
Consumer price	0.03	0.27	0.88
Agri products	0.21	0.70	0.66
Food products	0.00	0.03	0.05
North Karelia	Diversified farms	Modern investment	Traditional investment
Price of Value Added	2.45	-0.27	-0.16
Agriculture	-19.66	-19.53	-19.5
Food industry, rural	-0.20	-1.14	-1.17
Producer price	0.05	0.34	0.72
Agri products	0.17	0.95	0.93
Food products	0.03	0.31	0.34
Consumer price	0.02	0.13	0.29
Agri products	0.14	0.79	0.77
Food products	0.01	0.06	0.07

The incomes of the agricultural households decreased. Concerning the diversified simulation, the agricultural households in North Karelia were more vulnerable. By contrast, urban firms and all the working households (except agricultural households) gained because of the investment simulations, while incomes of other households, i.e. pensioners, unemployed and students simultaneously decreased. In addition, rural firms in North Karelia were among the losers. (Table 36)

Table 36. Income of domestic firms and households, %ch.

South Ostrobothnia	Diversified farms	Modern investment	Traditional investment
Rural firms	0.18	0.65	3.04
Urban firms	0.16	3.48	4.62
Agricultural HHs	-0.28	-9.84	-9.39
Rural working HHs	0.05	0.57	1.49
Rural other HHs	0.00	-0.25	-0.08
Rural commuter HHs	0.06	0.52	1.58
Urban working HHs	0.06	0.82	1.72
Urban other HHs	0.00	-0.06	0.12
North Karelia	Diversified farms	Modern investment	Traditional investment
Rural firms	1.05	-0.77	-0.45
Urban firms	0.11	1.03	0.81
Agricultural HHs	-2.40	-9.14	-8.99
Rural working HHs	0.27	0.11	0.4
Rural other HHs	0.04	-0.05	-0.03
Rural commuter HHs	0.10	0.31	0.53
Urban working HHs	0.10	0.27	0.49
Urban other HHs	0.00	-0.01	-0.01

6.4 Discussion

Both of the investment shocks resulted in positive total impacts in terms of the gross regional domestic product and regional employment in both of the regions. This result suggests that as the activity specific subsidy was allocated to regional investments, the production factors moved to more efficient industries that were able to generate more returns and employment. Traditional investments, (i.e. construction and machinery) created stronger positive effects in comparison with Modern investments, (i.e. electronic equipment and business and trade services).

By contrast, transfer of the income subsidies from traditional agriculture to diversified activities resulted in different effects in the study regions such that the regional total GDP effect was positive in North Karelia, while in South Ostrobothnia it was negative. This can be traced back to the importance of the food cluster in South Ostrobothnia. Through its linkages to the local economy, agriculture can generate higher economic outcome and thus use the income support more efficiently. In addition, the decreasing export incomes of the food products outweighed the

increased domestic sales of the products and services of diversified activities. An additional factor was the falling rent of agricultural land.

In North Karelia, the farm structure, the relative importance of the agriculture and food industry for the regional economy, the structure of diversified activities, and the relative importance of urban area differ from those of South Ostrobothnia. As a result of the farm diversification shock, employment and domestic sales of secondary and tertiary sectors increased relatively more in North Karelia, and the whole region benefited in terms of GDP. Shucksmith et al. (2005) have also suggested that the CAP second pillar, at least in some cases, may contribute cohesion targets. More generally, however, previous research has found evidence both against (Shucksmith et al. 2005; Esposti 2007), and for (Rizov 2004; Daniel & Kilkenny 2009) the ability of the CAP to promote rural development. A common positive impact for all the agricultural policy simulations of this research was that both foreign and government savings increased and thus boosted local investments.

The results suggest that transferring CAP payments from actual agriculture as income support to diversified activity does not promote rural development and economic activity measured at the regional level when the agriculture and food industry are at the core of the rural economy. By contrast, if the relative position of agriculture is already of minor importance, diversified activities could produce welcome extra income for the local economy. However, in both cases, agricultural households suffered. In a conclusion, all the simulations generated higher positive GDP effects to the urban areas compared with the rural areas, thus suggesting agglomeration development.

7 Infrastructure policy simulations

7.1 Introduction

Transportation costs are considered to be one of the major factors directing the location decisions of enterprises, and determining how enterprises, especially in remote rural areas, will thrive in the long run. In sparsely-populated Finland, the operation of transportation systems is particularly important since distances are long both within the country and to the core market areas in Europe. In addition, varying weather conditions pose extra challenges for transportation networks.

The competitiveness and prosperity of local businesses and people are increasingly dependent on their skills in using all the available territorial assets. Yet in globalised markets, competitiveness is also dependent on the ability to build links with other territories, both in terms of traditional infrastructure and in public and business relations. These connections would ensure that common assets will be used in a coordinated and sustainable way (Bröcker 2002). Not surprisingly, infrastructure investments have become essential political expedients in improving competitiveness, reducing regional disparities and thus promoting both social and economic cohesion in the European Union and in Finland. Indicatively, transport and infrastructure improvements have also become an important target in deciding where development funding should be channelled. During the programming period 2000-2006, the EU directed over 34% of cohesion policy spending to transport infrastructure improvements, and during the period 2007-2013 transport infrastructure investments have been and will be important elements of the EU cohesion policy (European Commission 2007, 2008a).

However, both national and EU policy makers (e.g. EU Commission 2008b; Ministry of Transport and Communications 2007) agree that public actors and tax payers should not be single-handedly responsible for attaining these goals and reconciling the challenges. On the contrary, in order to find new sustainable choices for transport policies and innovations in operations, cooperation between various actors is needed to reconcile these challenges. This implies that the private sector should be more involved in building and renewing infrastructures, thus entailing new innovations, enhancing efficiency and enlarging risk sharing.

There is a long-standing tradition in explaining the location of economic activity starting from Von Thünen (1826), who depicted the relationship between location and land use, and a leading developer of the classical location theory, Weber (1909). Moses (1958) and Isard (1956) incorporated substitution behaviour into the Weber model, such that firms were trading off transportation costs against production costs. Lösch (1959) concluded that location patterns are determined by factor and transport costs. Later on, representatives of the new economic geography (e.g. Krugman 1991, Fujita et al. 1999, Fujita and Thisse 2002) have, among other things, analysed the reasons why a reduction in transport costs may lead to agglomeration. They have emphasised that not only transport costs but also other factors, such as factor endowments and prices, economies of scale, amenities, spatial spillovers and imperfect competition influence economic agglomeration or dispersion.

Previous empirical research concerning the impacts of the infrastructure and transport improvements on regional development has shown rather mixed, even contradictory results. These results suggest that the possible agglomeration or dispersion is dependent on region-specific characteristics. There is a considerable number of empirical studies regarding rural development and agglomeration following the framework of New Economic Geography. Puga (2002) in the literature review concerning EU regional policies in the light of location theories, could not find unambiguous evidence that lower transport costs would foster convergence. Subsequent studies have further confirmed this conclusion. Fujita and Thisse (2006), for example, suggest that enterprises' transport costs and communication costs cause different effects on the spatial organisation of economic activities. Further, Partridge et al. (2008) concluded that the economic costs of remoteness appear to be increasing regardless of cuts in transport costs, technological advances in communication, and the dispersion of manufacturing to low-cost locations.

Corresponding results are also found from previous results attained through computable general equilibrium (CGE) modelling. Kilkenny (1998) by using a rural-urban CGE model found that reductions in transport costs facilitated concentration. However, the relationship between transport costs and rural development was nonlinear such that in cases of high transport costs, reductions favoured concentration, whereas in cases of relatively low industrial transport cost rates, further reductions favoured the industrial development of a natural-resource-based economy. Lofgren and Robinson (1999) built a spatial-network, CGE model that combined the strengths of the CGE and partial-equilibrium programming models, with which they analysed the impact of reduced domestic transportation costs. The results suggested that even if increased efficiency of transportation

services resulted in a positive aggregate impact, it might actually hurt the region that provided transportation services. Haddad and Hewing (1998), for one, found that the attained benefits accumulated in more developed regions. Bröcker (2002) carried out simulations with a multiregional CGE model at the European level. He reduced the overall level of transport costs and compared the spatial allocations with lower and higher levels of transport costs. He concluded that transport cost reduction may, to some extent, reduce relative income differences in Europe. He could not, however, find evidence that the cost reductions could reduce absolute income differences. Haddad et al. (2010) evaluated the impacts of the port costs on regional inequality, and concluded that investment had significant regional development policy implications. Bröcker et al. (2010) evaluated the welfare effects of 22 infrastructure projects chosen for the Trans-European Transport Networks (TEN-T) priority list. Nonetheless, they did not find evidence that these projects would enhance EU cohesion.

Infrastructure affects the output of firms both directly and indirectly. A direct effect is that infrastructure serves as a priced or non-priced input in production. Indirect effects occur when infrastructure interacts with other inputs and affects their productivity, or when it serves as an amenity that increases the supply of other inputs (Immergluck 1993). An advantage of the CGE approach is its ability to incorporate both transportation costs and production costs in the determination of the regional location of economic activity (Buckley 1992). Different approaches are used to capture transport costs in a CGE model. One is the iceberg transportation cost hypothesis (Samuelson 1952), which assumes that a certain percentage of transported commodity "melts" during transportation. Another approach adopts an independent, exogenously modelled "transportation satellite module" through which the shocks are channelled. Such an approach is applied in order to study infrastructure effects in a CGE framework (see, for example Kim et al. 2004). A third approach, also applied in this thesis, requires an inclusion of a specific transportation activity in the SAM. An advantage of this approach is its consistency with the treatment of transport in the regional Input-Output tables. In this study, the rural and urban transportation activities were already constructed in the SAM, thus readily enabling the exploitation of explicit rural and urban transportation sectors for the simulations. This structure and its consistent backward and forward linkages enable all prices and quantities to react to the infrastructure shocks, and finally, these changes affect the utility and income of the institutions.

This chapter considers how transport infrastructure improvements affect the regional economies, and whether the resulting effects are more favourable for the rural or for the urban areas of these regions. In addition, the results are evaluated from the point of view of agriculture and food industries. This is important especially for South Ostrobothnia, which is an important producer and exporter of agricultural and food products. The food industry is transportation intensive, since raw materials are collected from a relatively large area, and more importantly, because the main markets of the food products are in Southern Finland.

The following simulations aim at illustrating permanent and far-reaching infrastructure improvements that would underpin the economic development of the entire regional economies. In addition to traditional transport and communication network building, the changes might be followed by public support that encourages local enterprises to improve their efficiency or find new innovations. The public expedients in question could be, for example, investment or R&D support.

7.2 Simulations

Even though the model might enable us to model multiproduct industries, in this study an overall efficiency improvement of all the transportation-related services is modelled. Each transportation activity summarises the transactions of transportation, telecommunication, postal services and travel agency services, thus following the structure of Statistics Finland's regional input-output tables (TOL2002). Measured from the Social Accounting Matrices, the transportation sectors comprise 7.5% of the regional GDP and 5.6% of the regional employment in South Ostrobothnia. In North Karelia, the transportation sectors comprise 8.2% of the regional GDP and 6% of the regional employment. In South Ostrobothnia, the share of the transportation costs of the output of agriculture was 0.5% and approximately 7.5% of the output of the local food industries. The corresponding figures in North Karelia were 0.5% and 7.6%.

Two different simulations were carried out. The first simulation follows Haddad & Hewing (1998), who experimented with an overall 20% growth in the productivity of the transportation sector, and Doi et al. (2006), who similarly increased the efficiency of Japanese port by 20%. Taking account of the fact that new technological innovations have already been widely adopted in Finland and that

the infrastructure is well developed in Finland, a lower (10%) increase in efficiency was considered empirically more conceivable and thus adopted in this study.

Firstly, 10% growth in the total productivity of the transportation sectors was modelled as a change in the efficiency parameter (α_a^{va}) in the constant elasticity of substitution value added function of the transportation activities (equation 23 on page 80). This efficiency improvement increases the marginal productivity of primary factors: it enables producing the same output with less labour and capital or, correspondingly, producing a greater amount of output with the same amount of labour and capital. The marginal rate of substitution between labour and capital, however, does not change.

The second simulation aims at reflecting the situation when the transportation costs of all activities are cut by 10 percent. This kind of simulation is applied in Pouliakas et al. (2007). In the simulation, an intermediate input coefficient *(ica)* is cut by 10%, thus reducing the unit costs of other industries through their transportation cost component. Technically, this reduces the intermediate demand of transport service since the intermediate input coefficient *(ica)* = input use / output quantity and:

$$QINT_{c\,a} = ica_{c\,a} \cdot QINTA_a \qquad a \epsilon A, c \epsilon C \qquad (31)$$

$$\begin{bmatrix} intermediate\ demand \\ for\ commodity\ c \\ from\ activity\ a \end{bmatrix} = f \begin{bmatrix} aggregate\ intermediate \\ input\ quantity\ for\ activity\ a \end{bmatrix}$$

As for the factor market, simulations were carried out under a so-called Keynesian closure, which allows labour supply to vary but assumes that the factor price of labour is fixed. Further, land and capital factors were fully employed and mobile, thus aiming to reflect the long-term effects of infrastructure improvement.

7.3 Results

The macroeconomic impacts of transportation shocks on the regional economies of South Ostrobothnia and North Karelia are presented in Table 37. Generally, changes are parallel in both of the regions. However, there are also differences. The effects of efficiency improvement are stronger in North Karelia, while the cost cut simulation shows larger effects in South Ostrobothnia. Especially investments respond strongly in South Ostrobothnia showing a surprising 30% cut

resulting from a 10% transportation cost cut. In terms of the regional GDP, efficiency improvements show positive totals in both of the regions, whereas the cost cut scenario resulted in a negative total GDP effect in North Karelia.

Table 37. Macroeconomic indicators, %ch.

South Ostrobothnia	BASE EUR mill	Efficiency improvement	Cost cut
Private Consumption	2448.79	1	0.83
Investments	718.55	10.58	-30.03
Exports	2442.42	-0.04	7.07
Imports	2534.21	1.41	-2.05
GDP at Factor Costs	3424.46	1.51	0.26
North Karelia	BASE EUR mill	Efficiency improvement	Cost cut
Private Consumption	2036.25	1.38	0.48
Investments	630.52	12.55	-15.32
Exports	1888.51	1.01	3.89
Imports	2047.64	2.83	-1.7
GDP at Factor Costs	2931.69	1.94	-0.04

First, the GDP effects measured at factor costs are further considered. Table 38 shows that the regional GDPs of primary sectors fall as the efficiency of transportation sectors is improved. Further consideration shows that figures for agriculture in both of the regions are slightly positive. The corresponding figures for forestry are -5% for South Ostrobothnia and -2.6% for North Karelia. Secondary and especially tertiary sectors gain, particularly transportation and construction. In South Ostrobothnia, the positive impacts are larger in the urban area. However, the result in North Karelia is the opposite, since the rural area earns higher benefits.

When comparing the results of the cost cut simulation, the regions show different total effects. South Ostrobothnia has a positive total effect, such that the rural area is gaining and the urban area is losing. In contrast in North Karelia, where the total effect is negative, the rural area is losing while the urban area is gaining. Primary industries are gaining in both regions, but in South Ostrobothnia rural secondary is gaining and tertiary losing, whereas urban tertiary is slightly gaining but urban secondary clearly losing. In North Karelia, secondary sectors are gaining and tertiary losing in both the rural and the urban areas. The value added of agriculture and food industries was more responsive to the cost cut simulation than to the efficiency improvement.

Table 38. GDP at factor costs, %ch.

South Ostrobothnia	BASE EUR mill	Efficiency improvement	Cost cut
TOTAL	3424.46	1.51	0.26
Rural	2587.25	1.36	0.41
Primary	460.40	-1.10	2.19
Secondary	796.64	0.69	2.67
Tertiary	1330.21	2.61	-1.57
Urban	837.21	1.98	-0.19
Primary	15.22	-3.29	16.56
Secondary	182.86	2.04	-3.16
Tertiary	639.13	2.09	0.26
Agriculture	319.52	0.06	0.29
Food industry, rural	157.79	0.55	1.82
Food industry, urban	52.63	0.10	2.87

North Karelia	BASE EUR mill	Efficiency improvement	Cost cut
TOTAL	2931.70	1.94	-0.04
Rural	1724.00	2.06	-0.12
Primary	348.80	-1.09	2.98
Secondary	523.80	2.33	0.33
Tertiary	858.50	3.14	-1.62
Urban	1207.70	1.76	0.08
Primary	0.00	0.00	0.00
Secondary	321.90	1.65	1.05
Tertiary	885.80	1.81	-0.27
Agriculture	117.55	0.11	0.25
Food industry, rural	24.52	2.05	4.08
Food industry, urban	14.40	1.79	4.60

Employment and capital rent effects are presented in Table 39. Even if the labour markets are integrated in the simulation, the demand of different labour categories in each rural and urban industry can be considered. Agriculture's demand for both labour categories increased in both of the simulations. This holds true for the food industries as well. The total employment effects were positive excluding white collar employees in the cost cut scenario in North Karelia.

Capital rents increased as a consequence of the efficiency improvement in each of the categories, and the price of urban capital accrued the most. By contrast, the cost cut simulation increased the rents of the rural and agricultural capital clearly more than the rent of the urban capital. The housing rents also increased.

Table 39. Effects on employment and factor rents, %ch.

South Ostrobothnia	Efficiency improvement	Cost cut
Employment		
White collar	1.3	0.26
Blue collar	1.48	0.67
Factor rents		
Rural Capital	1.81	1.86
Agricultural Capital	0.88	4.35
Urban Capital	2.71	-0.01
Housing rents	1.21	1.48
North Karelia	Efficiency improvement	Cost cut
Employment		
White collar	1.9	-0.21
Blue collar	2.28	0.05
Factor rents		
Rural Capital	1.42	2.5
Agricultural Capital	1.41	2.56
Urban Capital	2.08	1.2
Housing rents	1.74	0.88

On the aggregate level, the efficiency improvement accelerated domestic activity and domestic sales in both of the regions. However, exports decreased in South Ostrobothnia while they increased in North Karelia. Imports increased in both of the regions. Imports benefited from both the lower transportation costs and the increase in economic activity and household demand. By contrast, the cost cut simulation was followed by a decrease in domestic sales and imports, whereas exports increased. Especially the export of food products, products of extractive industries, textiles, timber and base metal industries increased. (Table 40)

Table 40. Effects on exports, imports and domestic sales, %ch.

	South Ostrobothnia			North Karelia		
	BASE mill EUR	Efficiency improvement	Cost cut,	BASE mill EUR	Efficiency improvement	Cost cut
Quantity of domestic sales						
All products	4563.70	2.04	-2.55	3782.70	2.62	-1.36
Agri products	424.17	0.19	0.86	115.32	0.60	1.30
Food products	174.23	0.39	1.77	45.66	1.43	2.85
Quantity of exports						
All products	2442.40	-0.04	7.07	1888.50	1.01	3.89
Agri products	57.34	-0.86	-3.87	48.86	-1.05	-2.23

Food products	808.78	0.44	2.15	150.15	2.11	4.70
Quantity of imports						
All products	2534.20	1.41	-2.05	2047.70	2.83	-1.70
Agri products	50.50	1.24	5.82	22.91	2.28	4.95
Food products	286.86	0.34	1.40	180.37	0.75	1.04

The value added prices of agriculture and food industries as well as the regional average aggregated value added price rose in both of the simulations. On the other hand, the producer and consumer prices of food products decreased in both of the simulations along with the growing supply of the food products and the increased efficiency of transportation (and the lower transportation costs). Agricultural product prices increased, however. The most important reason for this was the increased demand for agricultural products to supply the needs of the local food industries. However, concerning the efficiency improvement simulation, the increased domestic demand of both intermediate and final products increased the average producer and consumer prices. The cost cut simulations showed negative change in the average producer and consumer prices in South Ostrobothnia, but were positive in North Karelia.

Table 41. Price changes, %ch.

	South Ostrobothnia		North Karelia	
Price of Value Added	Efficiency improvement	Cost cut	Efficiency improvement	Cost cut
TOTAL	0.81	0.6	0.39	0.94
Agriculture	0.76	3.74	0.93	2.06
Food industry, rural	0.83	0.85	0.52	0.90
Food industry, urban	1.24	0.00	0.75	0.44
Transport industry, rural	-8.10	1.12	-8.29	1.55
Transport industry, urban	-7.61	0.00	-7.92	0.74
Producer price				
TOTAL	0.49	-0.93	0.17	-0.1
Agri products	0.53	2.43	0.83	1.79
Food products	-0.02	-0.19	-0.33	-0.88
Transport products	-7.63	-0.39	-7.30	-0.04
Consumer price				
TOTAL	0.21	-0.27	0.08	0.21
Agri products	0.47	2.17	0.69	1.49
Food products	-0.01	-0.07	-0.07	-0.18
Transport products	-4.96	-0.25	-5.69	-0.03

Investments increased as a result of the efficiency shocks, while they decreased due to the cost cut shocks. The investments are savings-driven in the model. Regarding the cost cut shocks, both the

government and foreign savings fell, foreign savings drastically, while with regarding to efficiency improvement, both government and foreign savings increased. This suggests that the cut in transportation costs encourages the exporting of low value added products instead of further manufacturing them in the region. This development discourages local investments. It is worth noting that both the regions are relatively dependent on assets coming from other parts of Finland.

Table 40. Changes in foreign and government savings, %ch.

	South Ostrobothnia			North Karelia		
	BASE mill EUR	Efficiency improvement	Cost cut	BASE mill EUR	Efficiency improvement	Cost cut
Foreign Savings	213.05	17.22	-105.47	164.78	23.64	-65.72
Government Savings	86.53	36.52	-1.77	82.04	39.52	1.86

Both simulations raised household incomes. In the model, households earn their income through wages, capital incomes and income transfers. All the six household groups have different income and expenditure structures. The cost cut was most favourable for agricultural households, increasing their incomes by 2.4% in South Ostrobothnia and 1.67% in North Karelia. Efficiency improvement especially benefited all working households, since the factor incomes and employment increased. It was more favourable than the cost cut simulations for all the household groups except the agricultural household and rural other, (non working) households, i.e. pensioners, students and the unemployed.

7.4 Discussion

Both shocks, the efficiency improvement of the transportation sectors and the cut in transportation costs for all the sectors, gave positive total impacts in terms of the gross regional domestic product and regional employment for South Ostrobothnia. This result corresponds to previous Finnish research (Törmä & Rutherford 2002; Honkatukia & Antikainen 2004; Honkatukia et al. 2006). However, the cost cut simulation showed a negative regional total for North Karelia, although the urban area gained.

On average, agriculture and food industries attained relatively higher benefits due to the infrastructure improvements compared with the aggregate industries. Even if the cost cut scenario was more favourable to agriculture and food industries, the whole regions earned higher benefits due to efficiency improvement since the regional GDP, employment and investments clearly increased more under this shock. In addition, manufacturing and especially the service sectors clearly gained. By contrast, the cut in transportation costs of all sectors boosted exports and thus enabled the cheaper transportation of products, which often had a relatively low degree of processing, to other parts of the country. At the same time, local investments decreased.

These results bear a resemblance to the findings of Kilkenny and Partridge (2009), who argue that, contradictory to the assumptions of the largely approved export base model, which assumes that a region's growth is led by export demand, operations that could relax supply-side constraints and boost service sector activity would enhance rural development more efficiently and successfully.

Previous research suggests that the possible agglomeration or dispersion following transportation infrastructure improvement is dependent on region-specific characteristics. The overall efficiency improvement of the transportation sectors in the case of South Ostrobothnia, and the cost cut scenario in the case of North Karelia complied with the results obtained by other studies (e.g. Haddad & Hewing 1998; Partridge & Rickman 2008), which suggest that benefits tend to accumulate in more developed regions (in this research the urban areas). On the other hand, the cost cut simulation results concerning South Ostrobothnia, and the efficiency improvement simulation results concerning North Karelia suggest that further reductions in transportation costs favoured the industrial development of a natural resource-based economy (in rural areas). Corresponding results can be found e.g. in Kilkenny (1998). Consequently, transportation cost cuts might enhance competitiveness of rural enterprises instead of increasing further leakages of the benefits to the urban centre.

8 Tourism policy simulations

8.1 Introduction

The continuous growth of tourism and its potential economic contributions has given the tourist industry a reputation as an effective device for regional development. This view is largely shared by both policy makers and academics in the European Union and in Finland. Consequently, improvements aiming at developing and strengthening tourism are also defined as actions eligible for financing, for example, from the European Regional Development Fund. In this sense, the policies enhancing tourism aim at equalising development gaps and improving the economic position of those European regions which are lagging behind. The importance of the tourist industry is recognised and acknowledged as an important source and potential for rural development in Finland. For example, during the EU programming period 2007-2013, one of the axes of the Finnish Rural Development Programme includes development objectives for rural tourism and further, one of the Theme and Work groups under the Rural Policy Committee, which orients Finnish rural policy, concentrates on rural tourism.

However, the role and position of the tourism policy is not at the very core of EU policy objectives. Anastasiadou (2006) argues that only recently, when it was incorporated into the EU Constitution, tourism has gained official status as an area of EU competence. Earlier, the different views on what constitutes an EU issue and what should remain national issues have been obstructing common policy formation. The particular fear has been that further harmonising would only result in more regulations. In addition, the subsidiarity principle has opposed common tourism policies. Nevertheless, in spite of the limited role of the EU in tourism development, the positive spillover effects of wide-ranging European economic and social policies have been considerable for the tourism industry (Halkier 2010).

This chapter considers the effects of the changes in tourism generated by various policy effects through the economic linkages that the tourist industry has with the local economy. Computable general equilibrium analysis is used as a device for revealing these effects. Other approaches based on economic linkages and focused on tourism are introduced, for example, in Beynon et al. (2009), who studied the importance of tourism industry through the economic rankings measured with multiplier and eigenvector methods. CGE analysis has been applied to a number of tourism studies

since CGE models are well suited for analysing tourism due to their multi-sectoral basis and due to their flexibility in examining various policy shocks (Blake et al. 2006a).

Pioneering work in applying CGE to tourism analysis has been carried out in Australia since the 1970s, led by the development of the ORANI and the MONASH models. Adams and Parmenter (1992; 1995), for example, have studied international tourism by using the MONASH model. In particular, researchers in the United Kingdom and North America have been active in applying these models since then (Dwyer et al. 2004). Previous research applying GCE analysis has considered the impact of tourism on local economies. Zhou et al. (1997), for example, examined the reduction of tourist expenditures on Hawaii's economy, and Blake et al. (2003) the consequences of foot and mouth disease on tourism in the UK. Further, Blake and Sinclair (2003) examined the impact of the US government's and the tourist industry's recommendations for policies for recovering from the backlash that the events of September 11 caused for the tourist industry. Blake et al. (2006b), in turn explored how the productivity in tourism businesses could be increased by studying the roles of changes in capital, innovation and the competitive environment. Blake et al. (2006c) combined traditional forecasting methods and quantifiable forecasting of a CGE model to study the contributions of tourism to the Scottish economy. A number of studies concerning the impacts of tourism in developing countries has also been carried out. For example, Sugiyarto et al. (2003) examined the economic impact of tourism demand and globalisation on income, employment, the government budget and the balance of payments in Indonesia. Blake et al. (2008) examined how tourism affects poverty in Brazil by studying economic and distributional impacts. Sheng and Tsui (2009) studied the (negative) externalities of tourism in Macao, and Yang et al. (2009) the impacts of the SARS epidemics on tourism in Taiwan.

Since Input-Output tables do not include the tourism industry as such, there is a certain difficulty in incorporating tourism into the models. Accommodation, catering and transport services represented the tourism industry in a number of studies, but only after the development of Tourism Satellite Accounts (TSAs) provided more detailed data for the purposes of tourism and CGE models. Tourism Satellite Accounts are extension of the national economic accounts that explicitly quantify the contribution of tourism and travel to different sectors of the economy. (Dwyer et al. 2004; Blake et al. 2006a.)

The tourism policy simulations of this study aim at reflecting future policy objectives and choices in which the local planners are most often named as the most important influences in increasing

tourism in rural areas. Hence, the simulations aim at describing the consequences of more efficient marketing efforts, enhanced networking and of overall efficiency improvements.

8.2 Simulations

Two different tourism simulations were carried out with the CGE model. For the first simulation, particular tourist households were constructed in the Social Accounting Matrices. The consumption structures of tourist households were drawn from the information of the Tourist Satellite Accounts provided by Statistics Finland (Ministry of Trade and Industry 2004). In the simulation, the consumption demand of the tourist household was increased by 10%. This extra income was transferred from the Rest of the World account. Regarding the base solution, the income of the tourist household in South Ostrobothnia was 60.873 million EUR and in North Karelia 59.684 million EUR. In practice, the simulation was conducted as follows:

TOURSIM('TOURISM') = 1.1 trnsfr('Rep-tourist','ROW');*

The second simulation captures the effects following a 10% increase in demand for accommodation and catering services (the hotels simulation). In practice, the simulation was carried out as follows:

*ROWEXPP('C-Hotel','EXPSHOTEL')= 1.1*PWE0('C-Hotel');*

Here, the assumption of a small economy was applied since these small regions face a perfectly flexible demand, an exogenous increase in the export price of the commodity accommodation and catering can be interpreted as an equivalent increase in demand for tourism services.

Because these two simulations provoke an increase in tourism through different accounts and sources, different sets of closure rules were experimented with. The final choices of the closures were based on the characteristics of the study regions and on previous research. Tourist household simulation follows Kinnunen (2005), who applied a similar type of tourist household in his research on the Åland islands in Finland, by fixing foreign savings and letting exchange rate vary. The simulation also adopts so-called balanced closure in determining savings-investments (Lofgren et al 2002). The second, the hotels simulation, combines flexible savings (and flexible foreign savings) with a fixed real exchange rate, and flexible capital formation. This simulation follows the procedure and closure rules applied in Pouliakas et al. (2007). As for the factor markets in both of the simulations, land factors are fully employed and mobile, capital factors are fully employed and activity specific and labour factors are unemployed and mobile.

8.3 Results

The results in Table 43 show merely marginal changes since the tourist industry is relatively small in both of the regions. However, they show the directions of the changes and the relative differences between the regions. The changes follow the same pattern in both of the regions apart from imports in the hotels simulation. North Karelia generally responded stronger to the shocks, especially when "foreign" demand for accommodation and catering services was growing. The simulations raised the regional GDPs in both regions.

Table 43. Macroeconomic indicators, %ch.

	South Ostrobothnia			North Karelia		
	BASE mill€	Tourist HH	Hotels	BASE mill€	Tourist HH	Hotels
Private Consumption	2448.79	0.209	0.007	2036.25	0.236	0.041
Investments	718.55	0.2	-0.008	630.52	0.248	-0.304
Exports	2442.42	-0.088	0.012	1888.51	-0.084	0.104
Imports	2534.21	0.155	0.006	2047.64	0.214	-0.007
GDP at Factor Costs	3424.46	0.039	0.006	2931.69	0.053	0.032

Table 44 shows the GDP effects in the rural and urban aggregated sectors. The urban area of Joensuu (in North Karelia) earned a relatively higher share of the regional GDP compared with Seinäjoki in South Ostrobothnia, the region where the rural area is relatively more important. As expected, services collected the major share of the benefits. Simultaneously, secondary sectors were losing their share along with the marginal reductions of primary sectors. Accommodation and catering services earned approximately 1% (Tourist HH) and 0.5% (Hotels) increases in value added in South Ostrobothnia. The corresponding growth for North Karelia was 1% and 3%.

Table 44. GDP at factor costs, %ch.

	South Ostrobothnia			North Karelia		
	BASE millEUR	Tourist HH	Hotels	BASE mill EUR	Tourist HH	Hotels
Rural	2587.25	0.029	0.005	1724	0.044	0.025
Primary	460.4	-0.009	0.000	348.8	-0.012	0.000
Secondary	796.64	-0.045	-0.001	523.8	-0.019	-0.034
Tertiary	1330.21	0.086	0.010	858.5	0.104	0.071
Urban	837.21	0.068	0.007	1207.7	0.066	0.043
Primary	15.22	-0.066	0.000	0		
Secondary	182.86	-0.011	-0.005	321.9	-0.025	-0.031
Tertiary	639.13	0.094	0.011	885.8	0.099	0.070
TOTAL	3424.46	0.038	0.005	2931.7	0.053	0.032

Table 45 presents the regional employment and factor rent effects. Both simulations generated increases in employment, with the larger effects emerging in North Karelia. Further consideration showed that demand for both white and blue collar employees increased more in the urban parts of the regions. In general, factor prices (rents) of both rural and urban capital increased. By contrast, regarding the tourist household simulation, the rents of agricultural capital and housing fell slightly.

Table 45. Effects on employment and factor rents, %ch.

	South Ostrobothnia		North Karelia	
Employment	Tourist HH	Hotels	Tourist HH	Hotels
White collar	0.082	0.009	0.119	0.043
Blue collar	0.067	0.013	0.083	0.072
Factor rents				
Rural Capital	0.053	0.009	0.031	0.047
Agricultural Capital	-0.138	0.003	-0.087	0.044
Urban Capital	0.128	0.015	0.106	0.094
Housing	-0.052	0.009	-0.074	0.052

The fact that the exchange rate was flexible in the tourist household shock is shown in Table 46. Exchange rates and thus export prices decreased by 0.052 % in South Ostrobothnia and by 0.047 % in North Karelia, and extra (foreign) tourist income flew into the regions. Yet, simultaneously as tourist demand increased, the regional exports, excluding the primary products, decreased. Both the imports and domestic sales of manufactured goods and services increased in both of the regions such that the increases were more significant in North Karelia.

Table 46. Effects on exports, imports and domestic sales, %ch.

	South Ostrobothnia			North Karelia		
Exports	BASE mill€	Tourist HH	Hotels	BASE mill€	Tourist HH	Hotels
Primary	168.7	0.006	0.000	165.4	0.006	-0.006
Secondary	2120.5	-0.089	-0.002	1554.2	-0.080	-0.001
Tertiary	153.2	-0.196	0.215	168.8	-0.190	1.196
TOTAL	2442.4	-0.089	0.011	1888.5	-0.083	0.105
Imports						
Primary	97.7	-0.061	0.000	84.5	-0.047	0.024
Secondary	1587.3	0.069	0.004	1269.1	0.155	-0.021
Tertiary	849.3	0.340	0.007	694.1	0.352	0.013
TOTAL	2534.2	0.155	0.005	2047.7	0.213	-0.008
Domestic Sales						
Primary	541.9	-0.018	0.000	310.2	-0.026	0.010
Secondary	972.4	0.059	0.001	782.1	0.095	-0.106
Tertiary	3049.4	0.107	0.007	2690.5	0.124	0.030
TOTAL	4563.7	0.082	0.005	3782.7	0.106	0.000

In contrast, the exports of services increased due to the hotels simulation. Especially the exports of accommodation and catering services in both of the regions increased (over 20%). However, this is mainly a consequence of the way the simulation was carried out (an exogenous increase in the world price of exports). The hotels simulation showed positive or nil effects on imports and on domestic sales in South Ostrobothnia. However, in North Karelia, the total imports decreased due to decreases in the imports of manufactured products. In addition, the domestic sales of secondary sectors decreased in North Karelia.

Incomes of all the firms and households increased when the demand for accommodation and catering services was increased by 10%. Tourist household simulation gave more mixed results, showing that the income of the firms and working households increased, whereas the income of the households dependent on the government transfers decreased marginally. The income of the agricultural households also decreased.

Table 47. Incomes of the domestic, non government institutions, %ch.

	South Ostrobothnia			North Karelia		
	BASE mill€	Tourist HH	Hotels	BASE mill€	Tourist HH	Hotels
Rural firms	490.11	0.093	0.015	428.83	0.064	0.076
Urban firms	195.27	0.196	0.022	234.76	0.160	0.143
Agricultural HHs	436	-0.048	0.006	156.51	-0.022	0.051
Rural working HHs	1146.46	0.043	0.010	850.43	0.050	0.059
Rural other HHs	697.5	-0.007	0.002	527.8	-0.004	0.004
Rural commuter HHs	233.68	0.035	0.011	183.61	0.069	0.061
Urban working HHs	468.84	0.046	0.011	625	0.056	0.066
Urban other HHs	171.89	-0.001	0.003	262.18	-0.003	0.009
Tourist HHs	60.87	9.942	0.000	69.61	9.948	0.000

As foreign savings decreased in the hotels simulation, investments also decreased regardless of the increases in government savings. On the other hand, balanced savings-investments closure was used with the tourist household simulations, implying that the investment and government consumption absorption shares were fixed in the simulation, yet the quantities were flexible (Table 48).

Table 48. Changes in foreign and government savings, %ch.

	South Ostrobothnia			North Karelia		
	BASE mill€	Tourist HH	Hotels	BASE mill€	Tourist HH	Hotels
Government savings	86.53	-0.306	0.244	82.04	-1.03	1.084
Foreign Savings	213.05	0	-0.155	164.78	0	-1.945
Investments	718.55	0.2	-0.008	630.52	0.248	-0.304

Table 49 below presents the price changes in the aggregate level, for trade and for the accommodation and catering services. Hotels simulation decreased both the consumer and producer prices of accommodation and catering services. By contrast, the increased demand of the tourist households increased consumer and producer prices of accommodation and catering while the aggregate consumer price decreased.

Table 49. Price changes, %ch.

	South Ostrobothnia		North Karelia	
	Tourist HH	Hotels	Tourist HH	Hotels
Value added price:				
Total	-0.021	0.007	-0.005	0.066
Accommodation and catering	0.440	0.221	0.504	1.481
Trade	0.009	0.007	0.024	0.029
Consumer price:				
Total	-0.021	-0.011	-0.009	0.001
Accommodation and catering	0.13	-0.049	0.178	-0.266
Trade	0.033	0.003	0.004	0.012
Producer price:				
Total	0.006	-0.003	0.003	0.006
Accommodation and catering	0.21	-0.071	0.274	-0.379
Trade	0.068	0.005	0.036	0.02

8.4 Discussion

The results suggest that an increase in tourism has positive effects on these regional economies. For both of the regions, the simulations resulted in benefits measured in the regional GDP, in employment and in the levels of domestic activity. Blake (2006c) has found corresponding results for Scotland. However, regarding the regions and simulations, the urban areas earned higher benefits compared with the rural areas in terms of GDP. In addition, demand for labour increased more in the urban areas. These results suggest that in these regions, the increased tourism incomes tend to concentrate on the urban areas and thus accelerate agglomeration. Simultaneously, if the resources are scarce, production factors might be transferred from the industries of lower productivity, such as agriculture, in order to meet the increased demand for tourist services. This kind of development creates opportunity costs.

Factor rents of both of the rural and the urban capital rose while the rents of the agricultural capital and housing fell slightly. Incomes of all the firms and households increased as the demand for tourism services increased. On the other hand, the alternative shock, in which the income of tourist households was externally increased, showed mixed results such that the incomes of the firms and working households increased, while the incomes of the households dependent on the government transfers marginally decreased. Again, the positive effects were larger for the urban institutions. This result coincides with Cooper et al. (2008) who argued that poor households are likely to be negatively affected via the price channel. Agriculture suffered as a result of falling agricultural capital rents, decreasing value added and decreasing agricultural product prices.

The results show rather marginal changes since the tourist industry is relatively small in both of the regions. However, this might also reflect the characteristics of the CGE model and the study regions. Dwyer et al. (2004) concluded that the CGE models typically indicate much more modest (and sometimes even negative) impacts than those attained with input-output or multiplier techniques. They argued that to this extent the model results reflect reality since often the main effect of a change is to alter the pattern of activity, not so much the overall level.

9 Validity of the results

It is often argued that results obtained from CGE models may be particularly sensitive to the parameter values not derived from the benchmark data, typically elasticities. However, sensitivity analysis can be conducted by including alternative parameter values in the model. In this study, the values of the trade elasticities: i.e. the so-called Armington elasticity for imports and the constant elasticity of transformation elasticity for exports were set in the BASE solution at $\sigma = 2$. The robustness of the model was tested by both decreasing and increasing these trade elasticity values, such that both $\sigma = 4$ and $\sigma = 0.8$ were tested. The results of the sensitivity analysis are presented in Appendix 4.

The results suggest that the model is relatively robust. Hertel (2002) concluded that this is because the data base and equilibrium assumptions also play key roles in determining the range of possible outcomes. In addition, since CGE applications often draw on high quality, published databases, the data dependence on these studies will be viewed as a strength of the approach. This holds true for this study as well, since the data used was accurate and to a large extent survey-based (also the regional I-O tables) and not derived from the national level as is often the case when building regional SAMs.

This study aimed at comparing the impacts of the different policy measures on the two rural regions and on their rural and urban areas. The aim was not to produce actual policy predictions. Thus it is more important to pay attention to the directions of the impacts and to the focus and scope of the different simulations instead of the absolute percentage changes.

The results attained from the earlier versions of some of the CGE simulations applied in this thesis, and additional simulations concerning the North Karelia region were discussed with the local policy makers and researchers. The interviewees were Jukka Oksa from the University of Joensuu, Vilho Pasanen from the North Karelia MTK (the Central Union of Agricultural Producers and Forest Owners), Kimmo Niiranen from the Regional Council of North Karelia, Eero Parviainen from Pro Agria North Karelia (an agricultural expert organisation), Timo Tanskanen from the Employment and Economic Development Centre of North Karelia, and Heikki Eskelinen from the Spatia (Centre for Regional Research, University of Joensuu).

During the interviews the core results of migration and earlier agricultural simulations were discussed. In addition, some aspects of transport simulations were considered. The interviewees were also asked additional qualitative questions on their views on transportation, infrastructure and tourism. A summary of these interviews is available in Simola et al. (2008, 121-125).

10 Summary of the main results

Rural and regional development policies were simulated by using SAM multiplier and CGE models. This summary collects the main findings, the emphasis being on the observed differences between the study regions and between their rural and urban areas.

Agriculture and rural and urban food industries possessed the highest aggregate output multiplier values in both of the study regions. This indicates that these activities have high potential in stimulating local economic activity through the network of economic linkages. In the urban areas, however, services and construction were among the industries with the highest income generating potential. In both of the regions, the economic "leakages" from the urban areas to the rural areas were higher than the reverse. This result points to the importance of urban areas for these regions.

Figure 8 illustrates the percentage changes in the aggregate outputs, produced by the multiplier scenarios, by regions and by rural and urban areas. Measures directed towards agricultural activities had relatively stronger impacts in South Ostrobothnia, while the impacts of the infrastructure and tourism shocks were stronger in North Karelia. When comparing the rural and urban areas, transportation and tourism especially benefited the urban area of South Ostrobothnia, while in North Karelia the infrastructure investments were more favourable for the rural area.

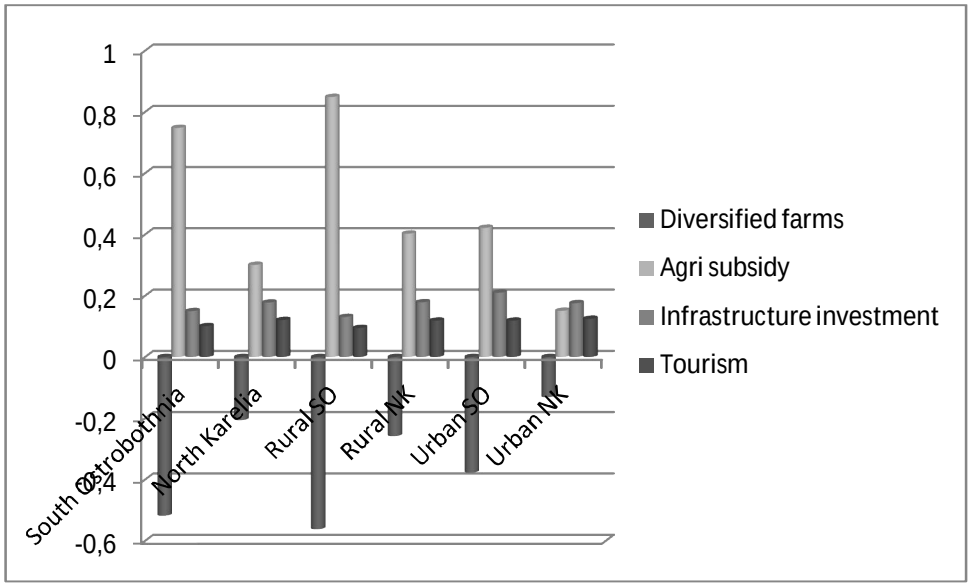


Figure 8. Percentage changes of the aggregate outputs.

Figures 9 and 10 further illustrate the differences between the study areas showing that the changes in agricultural subsidies particularly affected capital and land rents. This suggests that income subsidies tend to capitalise in agricultural land prices as, for example, Swinbank and Tranter (2004) have previously suggested.

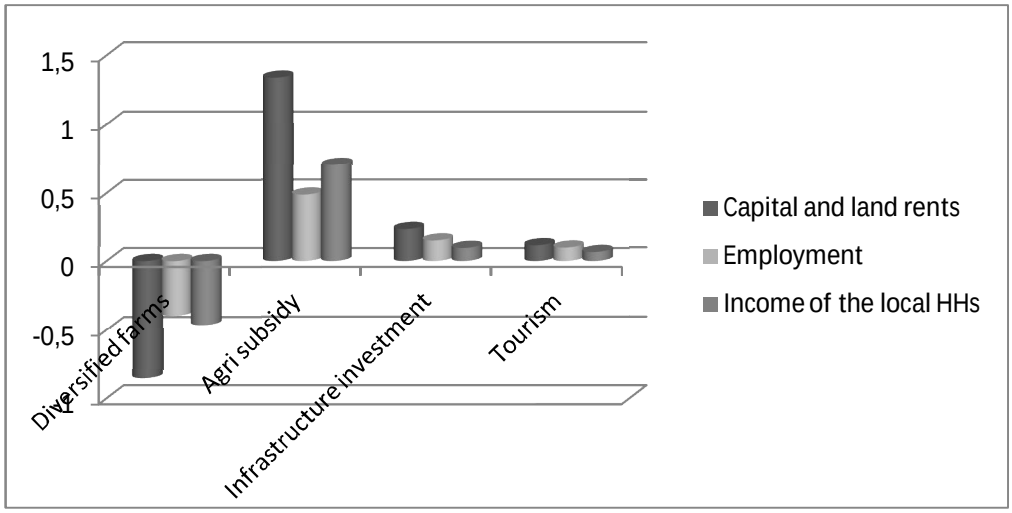


Figure 9. South Ostrobothnia, multiplier scenarios.

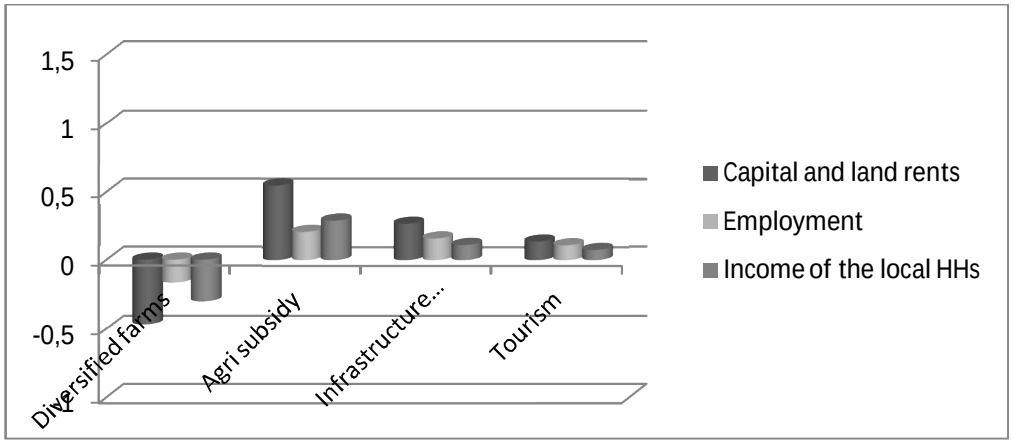


Figure 10. North Karelia, multiplier analysis.

Unlike the multiplier analysis, the CGE model results take account of, for example, the effects of endogenous price changes. Even if the simulations concern the same industries, new perspectives occur, since the CGE model gives a wider range of means of bringing shocks into the system. In addition, the model offers more diverse and thorough reporting of the effects on the different areas. Most of the CGE shocks reflected increased efficiency or increased demand that might follow from

the policies such as R&D, investment policies and increased marketing efforts. However, since agriculture is often recognised as a key preserver of a base rural settlement and economic activity, simulations concerning CAP II pillar modulation, i.e. transfers of funds from actual agriculture to the rural development measures, were also simulated.

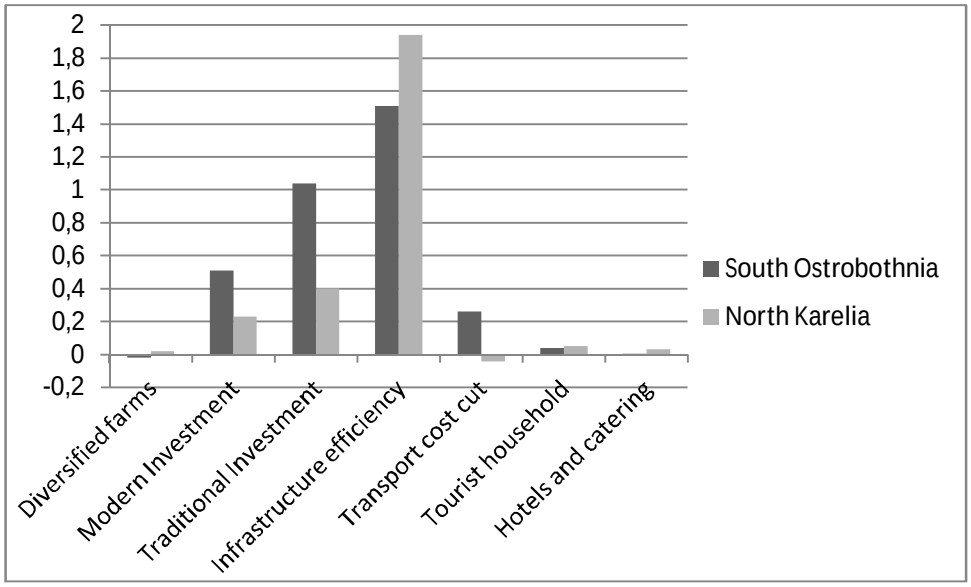


Figure 11. The total GDP effects, % changes.

Figure 11 illustrates the differences between South Ostrobothnia and North Karelia, and Figures 12 and 13 on page 133 the differences between their rural and urban areas. The CGE results shared the tendency of the multiplier analyses that the agriculture-related shocks were stronger for South Ostrobothnia, while the infrastructure and the tourism shocks were relatively more important for North Karelia. However, even if all of the parallel policy scenarios are not directly and unambiguously comparable, the results show that by allowing endogenous substitution effects through for example, flexible prices and connections to the rest of the world, CGE analysis brings further differences between the regions and additional distinctions of the rural-urban effects. The differences are detailed below.

The transfer of the income subsidies from traditional agriculture to the diversified activities resulted in different effects in the study regions: the regional total GDP effect was positive in North Karelia, while in South Ostrobothnia it was negative. The relative importance of the agriculture and food cluster is the major factor behind this result. In South Ostrobothnia, decreasing agricultural output and decreasing export incomes of the food products outweighed the increased domestic sales of the

products and services of the diversified activities. An additional factor was the falling rent of the agricultural land.

In contrast, the investment shocks resulted in positive total GDP and employment effects in both of the regions. This result suggests that as the activity specific subsidy was allocated to the regional investments, the production factors moved to more efficient industries that were able to generate more returns and employment. The "traditional" investments, i.e. increased demand for construction and machinery investments, caused stronger positive effects in comparison with the "modern" investments, i.e. increased investment demand for electronic equipment, business and trade services. This suggests that the manufacturing sectors are still relatively important for these regions. In both rural and urban South Ostrobothia, food manufacturing was the most important sector in terms of output. In North Karelia, the manufacturing of wood and wood products, pulp and paper production, and forestry took the lion's share of the rural output. In contrast, in Joensuu (urban North Karelia) the commercial activity of services was emphasised (Chapter 4.1.3).

Both the infrastructure shocks gave positive total impacts in terms of the GDP and employment for South Ostrobothnia. However, the cost cut simulation showed negative regional GDP for North Karelia, though the urban area gained. Even if the cost cut scenario was more favourable for agriculture and food industries, the whole of the two regions earned higher benefits due to efficiency improvement, since the regional GDP, employment and investments increased more under this shock. In addition, manufacturing and especially service sectors gained. By contrast, the reduction of the transportation costs in all the sectors boosted the exports and thus enabled the cheaper transportation of products of relatively low degree of processing. Particularly the exports of food products, the products of extractive industries, textiles, timber and base metal industries increased. At the same time, local investments decreased. (Figures 14 and 15)

An increase in tourism demand positively affected GDP and employment, and in North Karelia the benefits were relatively large compared with South Ostrobothnia. Again, the urban areas earned higher benefits in terms of GDP. In addition, demand for labour increased more in the urban areas.

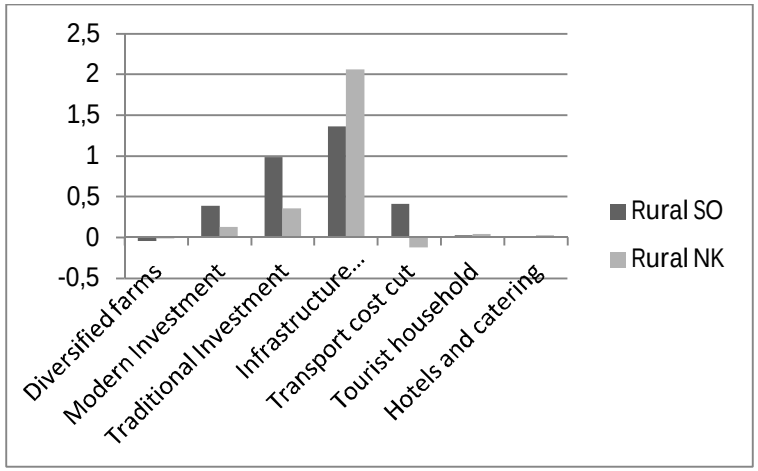


Figure 12. Rural GDP effects.

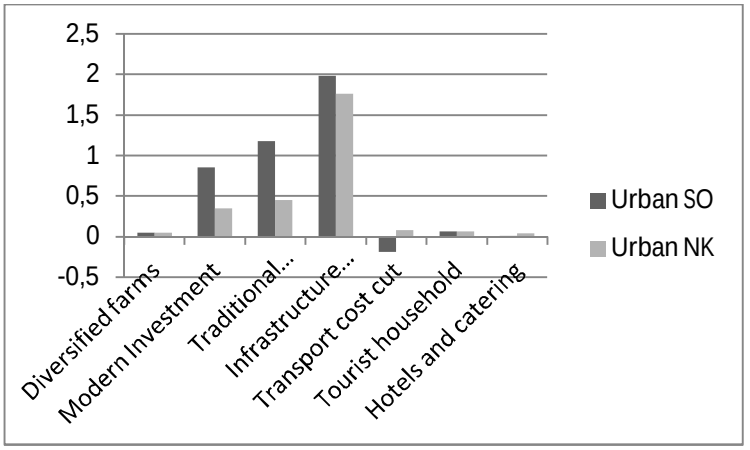


Figure 13. Urban GDP effects.

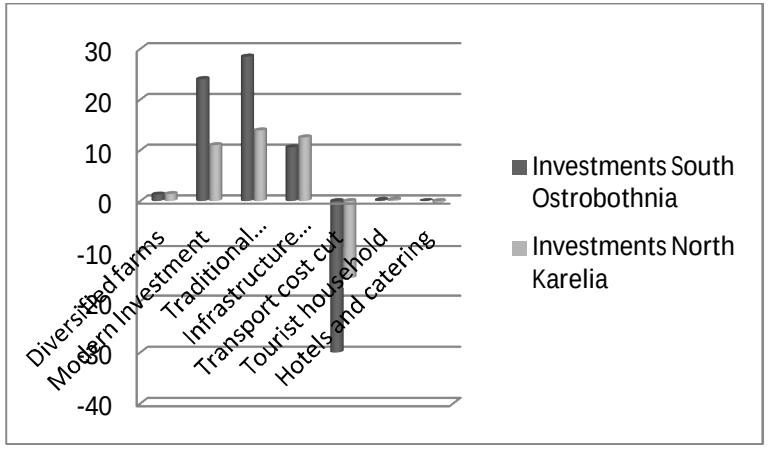


Figure 14. Regional investments.

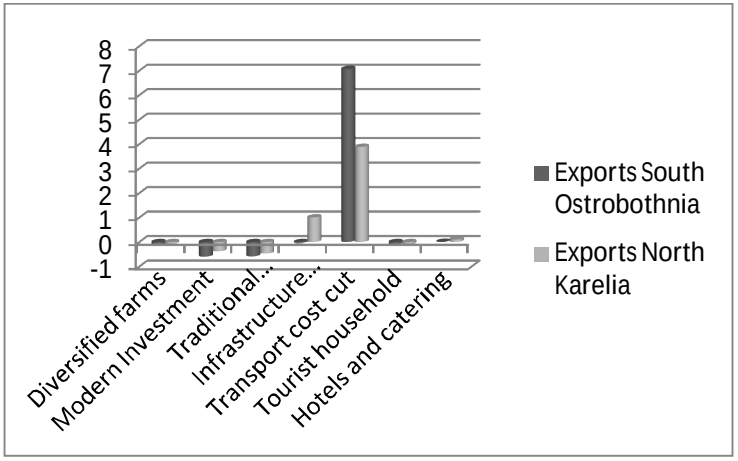


Figure 15. Regional exports

In the model, households earned their income from wages, capital incomes and income transfers. All the household groups had different income and expenditure structures. Both the transportation-infrastructure CGE simulations resulted in increasing household incomes (and expenditures) for all the household groups. In addition to increased employment and growing capital incomes, the decreased consumer price of transportation further benefited households. As a result of the agricultural simulations, the incomes of the agricultural households decreased. Incomes of all the other working households increased as a result of the investment simulations. In contrast, the incomes of the other households, i.e. pensioners, unemployed and students, decreased.

Increased demand for accommodation and catering services increased the incomes of all the household groups. By contrast, the increased income of tourist households showed mixed results in that the incomes of the working households increased, while the incomes of the households dependent on the government transfers, marginally decreased. This result was similar to the the regional investment simulation cases. The finding coincides with Cooper et al. (2008), who argued that poor households are likely to be negatively affected via the price channel. The common denominator for all the simulations was that the positive effects were often larger for the urban households.

An alternative approach to presenting the effects of the policy changes on households' welfare is to present the results in terms of the households' willingness to pay and their willingness to accept different policy outcomes. The CGE model calculates the consumer's level of welfare by utilising the welfare theorem and a money metric indirect utility function. Equivalent variation (EV) and compensating variation (CV) are defined more precisely in the CGE theory section, on page 75. In short, equivalent variation is the change in wealth that would be equivalent to the price change caused by the policy measure in terms of its welfare impact. In practice, EV is negative if the price change would make the consumer worse off. Compensating variation considers the same problem after the policy change has occurred. The CV is negative if the policy maker pays the consumer compensation for her loss. From the consumer's point of view this is the negative of the amount that the consumer would be willing to accept in order to be indifferent towards the price change.

Table 50 below shows the values of equivalent variation and compensating variation calculated for each of the CGE simulations. The interpretation of the results is as follows. Reading down the first column, the government should compensate agricultural households in South Ostrobothnia 0.87 million euro in order to bring them back to their original level of welfare after the transfer of agricultural subsidy to the diversified activity. Correspondingly, these agricultural households would be willing to pay 7.29 million euro in order to attain the increased welfare effects of the transport cost cut policy. In other words, this sum reflects the higher welfare level, measured in euro, that the transport cost cut policy would raise them to.

Table 50. Equivalent and compensating variation, EUR millions.

	Agri HH		Rural working		Rural commuter		Urban working	
	SO	NK	SO	NK	SO	NK	SO	NK
BASE EUR mill.	307.98	107.96	733.73	590.89	162.37	130.94	329.81	427.1
Diversified farms	-0.87	-2.59	0.39	1.56	0.11	0.12	0.2	0.41
Modern Investment	-30.24	-9.87	3.85	0.57	0.79	0.4	2.56	1.09
Traditional Investment	-28.92	-9.72	10.74	2.33	2.53	0.69	5.59	2.06
Infrastructure efficiency	3.01	1.6	9.53	12	2.65	2.72	5.06	9.2
Transport cost cut	7.29	1.73	5.48	4.57	1.81	0.34	2.15	1.73
Tourist household	-0.27	-0.1	-0.08	-0.19	-0.02	-0.02	-0.02	-0.12
Hotels and catering	0.01	0.4	0.07	0.35	0.02	0.08	0.04	0.28

	Rural other		Urban Other		Tourist HH		Total	
	SO	NK	SO	NK	SO	NK	SO	NK
BASE EUR mill.	622.03	440.68	145.06	209.37	60.87	59.68		
Diversified farms	-0.01	0.19	0	0	0	0	-0.2	-0.29
Modern Investment	-1.49	-0.2	-0.06	-0.01	-0.22	-0.07	-26.12	-8.32
Traditional Investment	-0.42	-0.15	0.2	-0.02	-0.14	-0.07	-11.14	-5
Infrastructure efficiency	1.61	0.13	0.65	0.24	0.81	0.86	24.26	27.79
Transport cost cut	2.05	0.68	0.35	0.22	0.19	0.08	20.36	9.87
Tourist household	-0.3	-0.35	-0.07	-0.16	5.98	5.83	5.13	4.8
Hotels and catering	0	0	0	0	0	0.004	0.16	0.84

As for the agricultural households, the shocks that cut the agricultural subsidy in favour of regional investments caused the biggest welfare losses. Particularly in South Ostrobothnia, the losses were considerable. If looking at the aggregate household EV and CV figures (the last columns), all the agricultural policy shocks resulted in decreasing welfare levels. It is worth remembering that all of them, except the diversified farm simulation in South Ostrobothnia, resulted in growing regional

GDP and employment and that, in fact, all the other except agricultural households attained higher levels of welfare. Thus the need for government compensation arises from the considerable losses borne by the agricultural households, and to a lesser extent, the falling welfare of the non working households whose loss is mainly a consequence of the rising consumer prices. However, compared with the base level, all the transportation and tourism scenarios resulted in higher aggregate household welfare levels in both of the regions.

Providing a final summary of the CGE analysis results, Appendix 5 collects the directions of the changes on the main economic indicators as a result of the simulations.

11 Conclusions and possible future research directions

Comparison of various policy simulations both from region to region and from rural to urban area indicated that the magnitude, and in some cases, the directions of changes were area specific. Moreover, this phenomenon characterises the agglomeration and dispersal effects of the applied policies. In South Ostrobothnia, where food production and manufacturing are important, the agriculture-related policies generated more significant impacts compared with North Karelia, a rural region having a more heterogeneous economic structure. Indicatively, North Karelia was more responsive towards the infrastructure-transportation and tourism policies.

In addition to the diverse economic structures, there are other area-specific features that may validate the different results. Polarisation of population and economic activity is characteristic of North Karelia. Although Joensuu is a relatively prosperous area, rural North Karelia, excluding the countryside near the urban area, suffers from outmigration and economic degradation. In contrast, both the population and the economic activity are rather evenly scattered throughout South Ostrobothnia. Therefore, compared with North Karelia, the relative distances are shorter and the region is more homogenous.

Previous research suggests that agglomeration or dispersion caused by regional policies is dependent on region-specific characteristics. This research affirms those findings. For example, concerning infrastructure improvements, there was evidence suggesting that benefits tend to accumulate in more developed regions (see e.g. Haddad & Hewing 1998; Partridge & Rickman 2008). Nevertheless, evidence suggesting that reductions in transportation costs favoured the industrial development of a natural resource-based economy was also found (see e.g. Kilkenny 1998). Importantly, the increased efficiency of the transportation sectors generated more significant benefits in the more remote rural area of North Karelia and particularly in its rural area. This suggests that such infrastructure policies can even out distances and slow down agglomeration in a highly remote rural area.

The agricultural policy results indicated that transferring CAP payments from actual agriculture to other farm-related activities (diversification) does not increase regional income, provided that agriculture and food industries are important for the rural economy, since through its forward and backward economic linkages agriculture can generate higher aggregate outcome, and thus use the

income support more efficiently compared with other farm-related activities. In contrast, if the relative position of agriculture is already of minor importance, diversified farms could produce extra income for the local economy, as was the case in North Karelia. Regarding policies in which agricultural subsidies were cut and the equivalent amount was transferred to regional investments, both the regional GDP and employment increased in both of the regions, and particularly urban areas benefited. However, these transfers resulted in considerable losses for agricultural households, and to a lesser extent, for non working households. Therefore, this welfare shift induced the need for compensation. Previous research has been both critical towards the ability of the CAP to promote rural development (Shucksmith et al. 2005; Esposti 2007), and also optimistic (Rizov 2004; Daniel & Kilkenny 2009). Despite a certain degree of scepticism, Shucksmith et al. (2005) concluded that the CAP second pillar, at least in some cases, may contribute to cohesion targets.

Both of the regions are net exporters of relatively low value added manufactured goods such as timber and food products. Also from this point of view, the findings were ambiguous. On the one hand, especially in the case of South Ostrobothnia, there was evidence that especially the food product exports are important for the region. On the other hand, the results suggested that further strengthening of local services would promote economic development more efficiently, as was the case in North Karelia. The latter result shares the findings of Kraybill and Dorfman (1992) and Kilkenny and Partridge (2009), who argue that, contradictory to the assumptions of the largely approved export base model which assumes that the growth of a region is led by export demand, operations that could relax supply-side constraints and boost service sector activity would enhance rural development more efficiently and successfully. The importance of the service sectors for the rural areas is highlighted by Bryden and Bollman (2000) and Rizov (2004). Tourism is the service often referred to in the rural development context. The tourism policy simulations resulted in growing regional income and employment for South Ostrobothnia and North Karelia, a result that coincides with the findings concerning Scotland (Blake et al. 2006b). However, increased tourism incomes tend to be generated in urban areas.

The results suggest that regional level policies, i.e. increased investments, increased tourism demand and a more efficient transportation sector, encouraged production factors to move to more efficient uses and to industries that were able to generate increasing regional income and employment. However, if the resources are scarce, production factors tend to shift from the industries of lower productivity, such as agriculture, in order to meet the increased demand for manufacturing and services. This development further increases depopulation and economic

degradation in genuine rural areas. Even if the policies resulted in a growing economic outcome at the regional level, the need for government compensations for the agricultural and for the non working households increased, because of their welfare losses due to the cuts in agricultural subsidies.

Theories of regional development provide explanations for the undeniable strength of the urban areas. Knowledge spillovers, backward and forward linkages, the advantages of thick markets for specialised skills and economies of scale are defined as sources of agglomeration economies and correspondingly, immobile factors, land rents and commuting as sources of dispersion (Marshall 1922; Mulligan 1984; Fujita and Krugman 2004). Of this list, linkages, factor mobility, land rents and commuting were endogenous in the CGE model, even if the testing of their role or effects on the regional development, except for backward and forward linkages, was not among the objectives of this study. The relative efficiency of the food cluster in South Ostobothnia and the forestry cluster and transport and tourism-related industries in North Karelia, measured in terms of output per working hour, were indications of the existing specialisation and scale advantages.

Notwithstanding that the theory of agglomeration classifies linkages as agglomerating sources, the consideration of agglomeration and dispersion through rural-urban linkages within a rural region offers perspective to a micro or "meso" level. The multiplier output analysis results indicated that urban activities spill over welfare to the surrounding rural areas. Accordingly, strong linkages do not exclusively accelerate agglomeration, in fact, quite the contrary. This finding coincides with Roberts (1998) but is contrary to Psaltopoulos et al. (2006). This is reasonable, since regarding both geographic and economic structures, the Scottish study areas resemble the Finnish study regions more closely than the Greek areas. Further, Henry et al. (1997) argue that if rural-urban linkages are strong and if urban growth causes positive spillover effects, a regional approach to development would be appropriate for rural areas.

The valuation of the results is dependent on the policy objectives. If the goal is to strengthen the overall regional development, the regional approach, i.e. accepting that urban areas are the engines of development, would be preferable since the urban areas are able to spill over benefits to the rural surroundings, as was also found in some previous studies (Henry et al. 1997; Durandon and Puga 2002; Partridge et al. 2008). However, the drawback of these measures is the further concentration of economic activity and the population in urban centres. On the other hand, if the policy goal is to support the genuinely rural areas in these regions, more targeted, rural-specific measures are

needed. Thus, knowledge of the specific features of the target areas is essential, since the same policy measures might have different effects depending on the economic structures of the region. This finding highlights the role of local actors and thus points to the importance of the principle of subsidiarity and of local governance.

The most important future research direction would be to include economies of scales and imperfect competition in the analysis, since that would enable a more thorough consideration of agglomeration and dispersion. Such an approach leads to the theoretical framework of New Economic Geography (NEG). However, Fujita and Krugman (2004) stress that the NEG models should work in a CGE environment in order to be able to show the origins and targets of the money flows. Kilkenny (1993; 1998) and Daniel and Kilkenny (2009) have adopted such an approach, and brought interesting insights into rural and urban linkages and simultaneously, into the agglomeration economics in the United States and the European Union. Moreover, dynamics is an important aspect of a spatial model when the objective is to observe more thoroughly the impacts of a particular policy measure in the long term, since structural changes develop over time. Furthermore, Richardson, in the 1970s, stressed that general location theory should be dynamic, since one of its main aims is to explain the impact of changes in techniques, transport costs, income levels and tastes, etc. on locational patterns of consumption and production.

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Appendices

Appendix 1. SAM South Ostrobothnia 1/12

	A-Ragri	A-Rdiver	A-Rforest	A-Rfis	A-Rmin	A-Rfood	A-Rtext	A-Rtim	A-Rpa	A-Rcok	A-Rmin	A-Rmet	A-Rmacl	A-Ree	A-Rtrq	A-Roth	A-Ren	A-Rcor	A-Rtra	A-Rho	A-Rtr	A-Rfir	A-Rbus	A-Res	A-Rpubl	A-Redu
A-Ragri																										
A-Rdiver																										
A-Rforest																										
A-Rfis																										
A-Rmin																										
A-Rfood																										
A-Rtext																										
A-Rtimber																										
A-Rpaper																										
A-Rcoke																										
A-Rminer																										
A-Rmet																										
A-Rmach																										
A-Reeq																										
A-Rtrq																										
A-RotherM																										
A-Renergy																										
A-Rconstr																										
A-Rtrade																										
A-Rhotels																										
A-Rtrans																										
A-Rfinan																										
A-Rbusn																										
A-Restate																										
A-Rpublic																										
A-Reduc																										
A-Rhealth																										
A-Rotherpr																										
A-Uforest																										
A-Umining																										
A-Ufood																										
A-Utext																										
A-Utimber																										
A-Upaper																										
A-Ucoke																										

Appendix 1 SAM South Ostobothnia 2/12

A-Rhealt	A-Rothpr	A-Ufore	A-Umi	A-Ufoo	A-Utext	A-Utiml	A-Upape	A-Ucoke	A-Umine	A-Um	A-Umac	A-Ueec	A-Utr	A-Uothl	A-Uene	A-Ucons	A-Utra	A-Uhot	A-Utra	A-Ufi	A-Ubu	A-Uest	A-Upu	A-Ued	A-Uhea	A-Uoth

Appendix 1 SAM South Ostrobothnia 3/12

C-agri	C-forest	C-fis	C-min	C-food	C-text	C-timber	C-paper	C-coke	C-mine	C-metal	C-mach	C-eeq	C-Trq	C-othM	C-energy	C-constr	C-trade	C-hotel	C-trans	C-bank	C-bnserv	C-estate	C-publics	C-educ	C-health	C-others
383,418																										
96,129		0,181		0,753		0,696											0,274	1,048			3,250					
	137,568																				0,281					
		2,334																			0,003					
			61,304	0,017		1,065		0,091	0,042		0,008				0,004	0,008	6,490		0,466		1,447			0,150		
1,458		0,556	0,189	736,383	0,033			0,833						0,010	0,053		9,880		3,364		15,757			1,291		
				0,039	83,857	0,116	0,053	0,526	0,020	0,573	0,031	0,016		0,037	0,009		1,175		0,052		0,771			0,017		
	0,090				0,040	268,290	0,127	0,102	0,001	1,038			0,139	0,131	0,125	0,520	5,530		1,118		3,881			0,345		
					0,013		49,795	0,280		0,040	0,005	0,413		0,009			0,297		0,835		12,427			0,262		
0,004			0,005	0,288	0,064	0,141	0,689	34,621	0,020	0,773	0,246	0,238	0,029	0,125	0,007	0,014	0,795		0,200		1,308			0,055		
			0,033		0,156			0,018	30,867		0,127				0,001	0,123	0,331		0,350		0,829			0,111		
					0,074	0,183	0,084	2,713	0,004	333,528	8,257	0,456	3,020	1,400	0,050	1,334	3,342		1,611		5,727			0,459		
					0,012	0,029		0,129	0,002	4,069	230,790	1,384	1,277	0,008	0,001	0,494	2,240		1,402		5,145			0,429		
							0,006	0,506		0,197	0,133	25,129	0,026	0,003		0,037	0,142		0,195		0,660			0,050		
					0,003	0,005		0,034		2,962	1,411	0,021	110,159	0,001	0,001	0,186	0,626		0,112		0,939			0,021		
					0,343	0,747	0,024	0,423	0,510	4,306	0,006	0,276	0,141	124,338	0,001	0,006	4,320		0,360		2,338			0,059		
															44,503	0,149	1,729				0,645					
																367,163	1,278		0,241		1,809					3,034
												1,832					348,272				6,596					
																		52,637			0,562					2,016
																	0,591		239,140		0,870					
																				52,999	2,366					
																					142,035	0,888		0,179		
																						417,769				
																0,836					11,212	4,042	139,275		0,293	
																1,974		1,398			1,745	0,307		181,754		
																1,115		5,033			1,804	0,812			324,280	
																0,297		1,707			4,330	0,083		3,486	2,103	115,031
	7,234																				0,021					
			19,340	0,015		0,337		0,031	0,014		0,005				0,002	0,006	2,041		0,151		0,459			0,049		
0,490		0,186	0,064	245,462	0,012			0,280						0,004	0,018		3,299		1,126		5,257			0,432		
				0,011	2,549	0,006	0,003	0,019	0,001	0,022	0,004	0,002		0,002	0,001		0,041		0,006		0,028			0,003		
	0,003				0,002	5,428	0,004	0,005		0,027			0,005	0,004	0,004	0,016	0,121		0,029		0,085			0,010		
					0,004		8,770	0,052		0,011	0,003	0,075		0,003			0,059		0,151		2,185			0,048		
0,004			0,001	0,047	0,010	0,021	0,095	4,676	0,003	0,109	0,036	0,034	0,006	0,018	0,002	0,006	0,113		0,032		0,180			0,010		

F-RCAP	F-UCAP	F-AGCAP	F-RAgrLand	F-RH	F-UH	F-SL	F-UL	RFirms	UFirms	H-Agr	H-Rwork	H-Roth	H-Rcom	H-Uwork	H-Uoth	Rep-tour	NPISH	Atax	Stax	Ytax	Gov	ROW	S-I	TOTAL
						0	0																	383,418
																								102,330
						0	0																	137,849
						0	0																	2,338
						0	0																	71,092
						0	0																	769,808
						0	0																	87,293
						0	0																	281,476
						0	0																	64,376
						0	0																	39,620
						0	0																	32,944
						0	0																	362,242
						0	0																	247,410
						0	0																	27,082
						0	0																	116,481
						0	0																	138,197
						0	0																	47,026
						0	0																	373,525
						0	0																	356,700
						0	0																	55,215
						0	0																	240,601
						0	0																	55,365
						0	0																	143,101
						0	0																	417,769
						0	0																	155,656
						0	0																	187,178
						0	0																	333,044
						0	0																	127,036
						0	0																	7,255
						0	0																	22,450
						0	0																	256,629
						0	0																	2,700
						0	0																	5,744
						0	0																	11,361
						0	0																	5,403

Appendix 1 SAM South Ostrobothnia 5/12

A-Uminer																								
A-Umet																								
A-Umach																								
A-Ueeq																								
A-Utrq																								
A-UotherM																								
A-Uenergy																								
A-Uconst																								
A-Utrade																								
A-Uhotels																								
A-Utrans																								
A-Ufinan																								
A-Ubusn																								
A-Uestate																								
A-Upublic																								
A-Ueduc																								
A-Uhealth																								
A-Uotherpr																								
C-agri	104,141	8,592				234,781	0,091			0,213											1,072			0,074		0,080
C-forest	0,023	0,001	16,243		0,017	0,039	0,040	89,238	0,289		0,044	0,020	0,003			0,246	0,240	0,087							
C-fis				0,228		3,982															0,280			0,002		
C-mining			0,047		10,178	1,240	0,080	0,079	0,109	0,395	2,085	2,870	0,061	0,003	0,032	0,019	7,094	4,348				0,002				0,007
C-food	54,986	10,752	0,305	0,039	0,900	202,819	2,106	1,957	0,555	0,394	0,270	2,760	2,521	0,202	0,552	1,268	0,449	0,634	1,694	10,921	0,480	0,179	0,581	0,865	0,589
C-text	0,051	0,051	0,044		0,165	0,784	22,416	0,577	0,106	0,268	0,305	1,253	0,671	0,045	0,210	3,734	0,081	1,047	2,847	0,145	0,091	0,060	0,318	0,112	0,200
C-timber	0,581	0,081			0,246	1,066	0,055	32,805	0,127	0,088	0,263	1,033	0,244	0,018	0,389	16,338	0,752	24,378	0,106			0,021	0,116	0,189	0,208
C-paper	0,333	0,333	0,272		0,681	18,318	1,352	2,666	18,787	0,480	0,398	2,677	1,919	0,167	0,395	1,537	0,314	0,665	7,006	0,342	0,759	0,262	2,089	0,635	1,377
C-coke	30,973	1,494	2,357	0,003	3,038	29,167	8,733	9,120	1,779	8,948	2,216	12,390	2,994	0,632	4,266	10,075	1,532	10,371	8,813	0,055	9,784	0,135	0,811	1,393	0,629
C-miner	0,682	0,169			0,216	3,705	0,008	2,909	0,005	0,170	4,312	4,521	0,437	0,034	1,085	1,198		24,099	0,891			0,014	0,062		0,111
C-metal	0,271	0,266	0,004		0,083	5,964	0,544	4,195	0,141	0,707	1,687	130,956	20,233	1,519	11,570	12,499	0,021	25,682	0,881	0,011	0,180	0,026	0,103	0,011	0,424
C-mach	2,168	0,777	0,006		5,933	13,879	0,499	2,915	0,471	0,290	1,368	17,170	63,672	0,257	9,168	1,120	2,487	13,317		0,895	0,032		0,032		0,999
C-eeq					0,272	0,568	0,038	0,404	0,271	0,926	0,084	11,162	9,004	7,472	8,418	0,991	0,172	8,192	7,599		1,115	1,300	4,339		0,939
C-Trq			0,272	0,003						0,021		0,752	11,707		18,767	0,159		0,022	3,527		3,167		0,003		0,378
C-otherM	0,015	0,004	0,006		0,012	0,061	0,767	0,208	0,007	0,005	0,033	3,781	0,283	0,003	1,620	10,194	0,006	4,712	2,051	0,173	0,022	0,324	0,575	0,018	0,190
C-energy	2,071	1,415	0,736	0,007	0,845	11,432	1,000	7,044	0,615	0,640	0,567	3,600	1,090	0,077	0,680	1,261	2,376	1,795	4,495	0,450	1,125	1,182	2,194	24,045	2,464
C-constr	1,706	0,453																21,358	0,371	0,806	1,914	0,741	7,707	45,340	0,225
C-trade	64,391	6,716	2,681	0,153	1,000	11,724	1,384	2,199	0,261	0,552	0,448	6,690	11,041	0,181	7,247	3,695	0,326	53,100	25,438	6,687	10,439	2,920	10,416	10,147	5,873

Appendix 1 SAM South Ostrobothnia 6/12

	0,119			78,240	0,003			0,029											0,603			0,038		0,047	
		0,855	0,005	0,013	0,001	1,818	0,051		0,014	0,004				0,013	0,113	0,035									
				1,343															0,158			0,001			
0,012	0,002	0,002	3,213	0,411	0,002	0,002	0,019	0,054	0,658	0,629	0,008		0,005	0,001	3,337	1,771			0,001				0,004	0,003
0,660	0,588	0,016	0,284	67,309	0,065	0,040	0,098	0,054	0,085	0,605	0,343	0,033	0,090	0,067	0,211	0,258	0,833	6,141	0,281	0,305	0,299	0,215	0,346	0,429
0,489	0,276	0,002	0,052	0,261	0,693	0,012	0,019	0,037	0,096	0,275	0,091	0,007	0,034	0,196	0,038	0,427	1,400	0,082	0,053	0,103	0,164	0,028	0,118	0,085
0,420	0,681		0,078	0,353	0,002	0,668	0,022	0,012	0,083	0,226	0,033	0,003	0,063	0,859	0,354	9,928	0,052			0,035	0,060	0,047	0,122	0,121
1,925	2,405	0,014	0,215	6,112	0,042	0,054	3,316	0,065	0,126	0,588	0,262	0,027	0,064	0,081	0,148	0,271	3,449	0,192	0,446	0,445	1,076	0,159	0,808	0,738
8,120	2,611	0,124	0,959	9,751	0,270	0,186	0,314	1,220	0,700	2,725	0,409	0,103	0,695	0,531	0,721	4,238	4,341	0,031	5,746	0,230	0,418	0,348	0,370	0,539
0,488	0,111		0,068	1,231		0,059		0,023	1,362	0,991	0,059	0,006	0,177	0,063		9,825	0,438			0,023	0,032		0,065	0,047
0,666	0,229		0,026	1,978	0,017	0,085	0,025	0,096	0,533	28,684	2,753	0,247	1,882	0,657	0,010	10,461	0,433	0,006	0,106	0,045	0,053	0,003	0,249	0,228
0,269	0,072		1,873	4,606	0,015	0,059	0,083	0,039	0,432	3,763	8,668	0,042	1,491	0,059	1,170	5,427		0,503	0,019		0,016		0,586	0,167
2,581	1,744		0,086	0,189	0,001	0,008	0,048	0,126	0,026	2,452	1,228	1,216	1,370	0,052	0,081	3,345	3,740		0,655	2,214	2,235		0,551	0,262
	0,000	0,014						0,003		0,165	1,595		3,054	0,008		0,009	1,734		1,858		0,001		0,222	
0,973	0,297		0,004	0,020	0,024	0,004	0,002		0,011	0,829	0,038	0,000	0,264	0,536	0,003	1,920	1,008	0,098	0,013	0,552	0,296	0,004	0,111	0,124
5,194	2,650	0,039	0,267	3,832	0,031	0,144	0,109	0,087	0,179	0,793	0,149	0,013	0,111	0,066	1,118	0,734	2,216	0,253	0,661	2,013	1,131	6,013	1,447	1,452
0,062	0,181															8,714	0,183	0,453	1,123	1,262	3,969	11,295	0,132	0,049
15,260	9,034	0,142	0,316	3,961	0,043	0,045	0,046	0,075	0,142	1,480	1,514	0,030	1,182	0,195	0,153	21,794	12,574	3,763	6,142	4,969	5,373	2,549	3,453	2,764

Appendix 1 SAM South Ostrobothnia 7/12

			0,011		0,050			0,008	9,728		0,042				0,001	0,042	0,109		0,113		0,262			0,037	
					0,018	0,042	0,020	0,598	0,001	73,178	1,815	0,102	0,665	0,309	0,012	0,297	0,740		0,358		1,261			0,103	
					0,003	0,006		0,020		0,559	31,432	0,191	0,176	0,002	0,001	0,072	0,313		0,196		0,706			0,061	
							0,002	0,084		0,036	0,024	4,060	0,006	0,002		0,010	0,029		0,036		0,110			0,010	
					0,002	0,003		0,008		0,485	0,232	0,005	17,896	0,001	0,001	0,035	0,109		0,023		0,157			0,005	
					0,020	0,042	0,003	0,025	0,028	0,228	0,004	0,017	0,009	6,505	0,001	0,005	0,230		0,025		0,127			0,005	
															20,935	0,073	0,816				0,306				
																149,960	0,527		0,102		0,743				
												0,904					171,538				3,252				
																		29,606			0,318				
																	0,351		140,444		0,513				
																				90,245	4,025				
																					73,166	0,460		0,093	
																						104,448			
																0,493					6,586	2,376	81,790		0,174
																0,932		0,659			0,824	0,148		85,523	
																0,504		2,262			0,814	0,368			145,685
																0,143		0,804			2,039	0,042		1,642	0,992

						0	0																10,403
						0	0																79,521
						0	0																33,738
						0	0																4,409
						0	0																18,962
						0	0																7,274
						0	0																22,130
						0	0																152,573
						0	0																175,694
						0	0																31,058
						0	0																141,308
						0	0																94,269
						0	0																73,720
						0	0																104,448
						0	0																91,418
						0	0																88,085
						0	0																149,633
						0	0																59,782
						0	0			13,907	11,146	23,086	2,422	4,943	5,330	1,193						57,338	-0,415	547,129
						0	0			1,096	4,177	3,835	0,903	1,845	0,883	0,248						49,915	3,645	176,002
						0	0			0,370	0,883	0,587	0,195	0,397	0,137	0,051						0,230	0,008	8,851
						0	0															61,207	2,458	102,461
						0	0			27,914	45,207	50,953	9,757	19,950	11,718	3,228						808,782	-0,027	1357,399
						0	0			3,771	20,474	5,225	4,430	9,052	1,204	0,861					0,1270	86,616	2,057	174,966
						0	0			0,096	0,235	0,068	0,050	0,103	0,016	0,011						227,776	-1,053	321,395
						0	0			7,118	17,201	14,948	3,745	7,640	3,455	1,061						59,279	9,153	213,958
						0	0			9,025	20,262	13,340	7,032	9,021	3,089	1,215					19,3855	43,976	1,964	341,739
						0	0			0,370	0,900	0,674	0,194	0,397	0,155	0,053						23,957	0,256	87,025
						0	0			0,356	0,869	0,607	0,187	0,383	0,140	0,049						366,008	5,373	642,309
						0	0			2,484	6,044	4,244	1,304	2,666	0,976	0,345						171,528	58,870	415,784
						0	0			5,312	12,992	9,850	2,827	5,768	2,276	0,765						21,536	82,340	233,679
						0	0			8,827	21,442	6,873	6,270	9,477	1,583	1,063						111,264	26,208	240,447
						0	0			1,763	9,589	4,344	1,743	4,231	0,999	0,441						117,710	3,488	177,348
						0	0			8,252	4,995	10,580	1,096	2,231	2,456								-0,002	140,183
						0	0														15,1619	74,541	402,926	600,892
						0	0			54,571	157,555	128,868	33,404	71,069	30,141	12,184					16,0533	7,517	10,606	881,672

Appendix 1 SAM South Ostrobothnia 9/12

C-hotel		0,272	0,172															0,393	1,648	0,295	3,257	0,711	0,906	0,420	3,268
C-transport	1,890	0,502	1,427	0,003	9,283	57,086	3,973	29,336	2,536	1,571	2,890	12,665	7,049	0,541	2,921	6,046	2,325	6,814	32,622	2,327	14,831	3,913	8,580	3,688	9,023
C-banking	0,895	1,710	1,441	0,053	0,920	4,813	0,897	2,662	2,895	1,704	0,464	3,876	3,955	2,539	0,960	1,422	0,874	4,289	4,488	0,931	2,860	3,208	3,243	16,590	3,748
C-busserv	8,790	2,337	2,233	0,004	5,588	62,520	7,719	12,740	8,660	2,299	2,805	24,214	23,993	2,444	4,688	13,402	3,746	20,164	24,134	3,659	7,887	2,792	21,696	10,047	18,943
C-estate																							0,042		0,166
C-publics	0,030	0,586	0,221		0,475	2,123	0,402	0,975	0,268	0,133	0,129	1,414	1,313	0,105	0,296	0,652	0,243	0,406	1,482	0,279	1,406	0,218	1,103	0,973	1,259
C-educ	0,045	0,045	0,031		0,066	0,300	0,053	0,138	0,038	0,019	0,018	0,198	0,186	0,015	0,041	0,090	0,034	0,057	0,272	0,040	0,141	0,267	0,582	0,106	0,932
C-health	5,977	0,093																			0,072		0,259		2,608
C-others	0,154	0,154	0,272	0,006	0,263	1,130	0,190	0,426	0,777	0,059	0,061	0,662	0,588	0,049	0,124	0,285	0,010	0,571	4,014	2,945	2,739	0,569	2,905	4,777	1,591
F-RCAP			94,015	1,736	23,055	72,504	12,291	30,380	10,372	10,154	3,654	40,209	9,473	2,932	14,451	15,558	14,738	54,365	85,970	4,225	98,093	17,920	23,229		11,131
F-UCAP																									
F-AGCAP	177,045	56,820																							
F-RAgrLand	41,200																								
F-RH	0,000																							280,145	
F-UH	0,000																								
F-SL	11,225	2,997	4,777	0,032	3,520	25,704	7,409	11,241	8,968	3,231	1,839	24,120	32,633	2,278	6,141	11,621	3,473	27,824	15,778	5,501	16,056	4,925	42,122	0,519	56,037
F-UL	23,862	6,371	10,152	0,128	3,464	59,586	14,763	36,698	6,131	6,189	6,769	51,936	41,629	5,565	22,307	24,493	3,880	59,141	115,718	11,169	48,170	10,466	7,435	0,519	24,020
EN-RFirms																									
EN-UFirms																									
H-Agr																									
H-Rwork																									
H-Roth																									
H-Rcom																									
H-Uwork																									
H-Uoth																									
Rep-tourist																									
NPISH																									
Atax	-150,087	-0,663	0,134	-0,059	0,872	-55,488	0,483	0,566	0,207	0,165	0,234	1,310	0,713	0,004	0,153	0,295	1,854	5,695	4,858	2,007	15,980	3,212	1,577	17,229	8,236
Stax																									
Ytax																									
Gov																									
ROW																									
S-I																									
TOTAL	383,418	102,330	137,849	2,338	71,092	769,808	87,293	281,476	64,376	39,620	32,944	362,242	247,410	27,082	116,481	138,197	47,026	373,525	356,700	55,215	240,601	55,365	143,101	417,769	155,656

4,925	0,969	0,009														0,164	0,826	0,166	1,931	1,206	0,470	0,108	1,931	1,237
9,815	6,697	0,075	2,934	19,213	0,123	0,602	0,448	0,214	0,913	2,796	0,965	0,088	0,476	0,319	1,095	2,793	16,107	1,309	8,721	6,661	4,424	0,925	5,303	2,632
3,131	1,895	0,076	0,291	1,610	0,028	0,054	0,511	0,232	0,147	0,853	0,540	0,413	0,156	0,075	0,412	1,753	2,211	0,524	1,680	5,464	1,671	4,144	2,201	1,274
17,678	10,631	0,118	1,765	20,864	0,239	0,260	1,528	0,313	0,886	5,321	3,273	0,398	0,763	0,705	1,763	8,234	11,880	2,058	4,631	4,755	11,175	2,506	11,120	4,778
	0,001																				0,021		0,097	0,006
0,869	0,797	0,012	0,150	0,721	0,013	0,020	0,047	0,018	0,041	0,314	0,180	0,017	0,048	0,034	0,114	0,167	0,734	0,157	0,828	0,371	0,569	0,245	0,741	0,247
1,942	1,690	0,002	0,021	0,102	0,002	0,003	0,007	0,003	0,006	0,044	0,026	0,002	0,007	0,005	0,016	0,023	0,135	0,022	0,083	0,455	0,301	0,027	0,549	0,895
5,718	0,538																		0,043		0,134		1,534	1,325
3,017	3,080	0,014	0,083	0,382	0,006	0,009	0,137	0,008	0,019	0,146	0,081	0,008	0,020	0,015	0,005	0,234	1,984	1,657	1,612	0,968	1,499	1,200	0,936	0,767
27,596	27,305																							
		4,948	7,280	24,159	0,380	0,620	1,830	1,385	1,154	8,831	1,292	0,477	2,352	0,819	6,935	22,187	42,291	2,376	57,562	30,518	11,960		6,533	7,213
																						70,034		
94,178	21,445	0,252	1,112	8,582	0,229	0,230	1,583	0,441	0,581	5,303	4,454	0,371	1,000	0,612	1,634	11,365	7,767	3,094	9,426	8,387	21,694	0,130	32,898	40,777
115,141	26,212	0,534	1,094	19,884	0,457	0,750	1,082	0,844	2,138	11,415	5,680	0,906	3,632	1,290	1,826	24,151	56,956	6,282	28,278	17,823	3,829	0,130	14,101	17,478
11,916	4,772	0,007	0,276	-18,497	0,015	0,011	0,037	0,023	0,074	0,290	0,098	0,001	0,025	0,016	0,873	2,341	2,404	1,130	9,410	5,465	0,814	4,338	4,845	2,450
333,044	127,036	7,255	22,450	256,629	2,700	5,744	11,361	5,403	10,403	79,521	33,738	4,409	18,962	7,274	22,130	152,573	175,694	31,058	141,308	94,269	73,720	104,448	91,418	88,085

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15,128	5,947	0,474	4,585	87,520	14,143	15,479	12,783	14,732	2,272	27,170	19,207	13,822	19,213	12,439	5,258	30,441	89,485	24,838	36,398	17,846	11,346	116,504	5,200	4,964	19,036
50,498	25,159	5,120	16,930	286,864	73,560	28,760	141,499	280,927	43,511	192,997	121,966	184,702	87,681	31,996	69,191	43,602	224,441	40,638	182,886	57,670	267,997	6,350	13,475	3,045	10,016
547,129	176,002	8,851	102,461	1357,399	174,966	321,395	213,958	341,739	87,025	642,309	415,784	233,679	240,447	177,348	140,183	600,892	881,672	160,629	611,522	218,759	611,501	654,597	239,739	284,708	502,578

						0	0			8,553	40,596	25,824	10,165	19,301	6,292	17,771						1,529		160,629
						0	0			22,263	53,182	33,943	12,564	23,882	7,912	16,534	2,189				26,1423	79,275	0,986	611,522
						0	0			14,259	34,356	18,148	7,508	15,302	4,204							17,194		218,759
						0	0			2,013	4,865	2,977	1,059	2,161	0,688		0,455				16,9995	29,475	102,569	611,501
						0	0			91,241	192,536	195,826	42,589	86,426	45,633									654,597
						0	0			3,177	7,511	5,092	1,682	3,407	1,196						187,8158	4,622		239,739
						0	0			2,947	6,958	5,636	1,561	3,160	1,326		22,482				226,6543	0,336		284,708
						0	0			12,140	21,469	35,953	4,810	9,740	8,447		13,269				368,8026	4,001		502,578
						0	0			6,155	38,292	20,548	4,875	17,264	4,805	3,797	48,523				22,3121	16,804	7,142	238,164
						0	0																	720,694
						0	0																	268,323
						0	0																	233,865
						0	0																	41,200
						0	0																	280,145
						0	0																	70,034
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	746,568
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1063,635
380,775		48,403	6,761	54,173		0,000	0,000																	490,112
	184,804				10,467	0,000	0,000																	195,271
		185,463	34,439	8,032	1,197	54,897	81,002	7,004													62,404	1,562		436,000
				88,439	2,684	315,700	460,003	76,430													136,860	66,339		1146,455
				89,835	1,488	0,000	0,000	42,395													558,632	5,199		697,549
				27,215	1,193	50,365	66,682	43,120	10,058												30,255	4,793		233,681
				11,102	29,808	119,189	160,017	21,520	49,527												46,624	31,051		468,838
				1,348	23,197	0,000	0,000	4,812	12,121												129,148	1,267		171,893
						0,000	0,000															60,873		60,873
						0,000	0,000			15,797	32,441	12,953	6,844	13,406	5,478									86,919
						0,000	0,000														0,710			-93,845
						0,000	0,000																	645,086
						0,000	0,000	126,564	33,660	103,443	269,585	60,217	56,566	101,877	14,022									765,932
						199,756	284,456											-93,845	645,086	765,932		149,231		1950,616
339,919	83,519					6,661	11,474																	2975,784
						0,000	0,000	168,269	89,905	8,779	110,695	2,348	7,897	23,742	7,333						86,530	213,054		718,551
720,694	268,323	233,865	41,200	280,145	70,034	746,568	1063,635	490,112	195,271	436,000	1146,455	697,549	233,681	468,838	171,893	60,873	86,919	-93,845	645,086	765,932	1950,616	2975,784	718,551	

Appendix 1 SAM North Karelia 1/12

	A-Ragr	A-Rdiv	A-Rfor	A-Rfis	A-Rmin	A-Rfood	A-Rtext	A-Rtimb	A-Rpap	A-Rcoke	A-Rmin	A-Rmet	A-Rmach	A-Reeq	A-Rtrq	A-RothM	A-Rener	A-Rcons	A-Rtrade	A-Rhot	A-Rfin	A-Rbusn	A-Rest	A-Rpubl	A-Reduc
A-Ragri																									
A-Rdiv																									
A-Rforest																									
A-Rfis																									
A-Rmining																									
A-Rfood																									
A-Rtext																									
A-Rtimber																									
A-Rpaper																									
A-Rcoke																									
A-Rminer																									
A-Rmet																									
A-Rmach																									
A-Reeq																									
A-Rtrq																									
A-RotherM																									
A-Renergy																									
A-Rconstr																									
A-Rtrade																									
A-Rhotels																									
A-Rfinan																									
A-Rbusn																									
A-Restate																									
A-Rpublic																									
A-Reduc																									
A-Rhealth																									
A-Rotherpr																									
A-Ufood																									
A-Utext																									
A-Utimber																									
A-Upaper																									
A-Ucoke																									
A-Uminer																									
A-Umet																									

Appendix 1 SAM North Karelia 2/12

A-Rhealth	A-Rothpr	A-Ufood	A-Utext	A-Utimb	A-Upap	A-Ucoke	A-Uminer	A-Umet	A-Umach	A-Ueeq	A-Utrq	A-UothM	A-Uener	A-Ucons	A-Utrad	A-Uhote	A-Ufinan	A-Ubusn	A-Uest	A-Upubl	A-Ueduc	A-Uhealth	A-Uotpr	A-Rtrans

Appendix 1 SAM North Karelia 3/12

A-Utrans	C-agri	C-forest	C-fis	C-mining	C-food	C-text	C-timber	C-paper	C-coke	C-miner	C-metal	C-mach	C-eeq	C-Trq	C-othM	C-energy	C-constr	C-trade	C-hotel	C-transp	C-bank	C-busserv	C-estate	C-publics	C-educ
	144,284																								
	19,495		0,061		0,262		0,262											0,093	0,065			1,056			
		243,131															1,148					0,431			
			5,457																			0,004			
				60,919	0,004		0,172		0,017	0,082		0,005				0,001	0,004	0,902		0,354		1,082			0,123
	0,249		0,095	0,034	122,814	0,006			0,144						0,002	0,010		1,574		0,551		2,594			0,220
					0,007	19,265	0,008	0,014	0,048	0,007	0,108	0,013	0,002		0,014	0,003		0,497		0,021		0,206			0,008
		0,110				0,009	257,396	0,036	0,019	0,001	0,160			0,023	0,986	0,413	0,080	2,142		1,104		3,891			0,382
				0,002		0,055	0,173	246,338	0,941		0,072	0,584	0,379		0,006	2,737		2,319		1,365		13,771			0,456
	0,002			0,067	0,393	0,298	0,667	3,055	155,112	0,018	4,288	1,151	1,068	0,127	0,591	0,054	0,007	3,273		0,640		5,240			0,164
				0,885		0,030			0,009	55,498		0,087				0,002	1,033	0,139		0,840		2,410			0,242
						0,007	0,031	0,016	0,786	0,065	88,349	2,748	2,499	0,324	0,227	0,001	0,115	1,505		0,946		7,320			0,314
						0,006			0,025	0,001	2,354	125,944	0,781	1,258	0,005	0,001	0,244	0,836		0,683		2,406			0,220
								0,044	1,483		0,209	0,535	34,961	0,004			0,040	0,431		0,108		1,283			0,034
							0,004		0,011		0,128	0,030	0,002	7,433		0,001	0,048	0,040		0,019		0,094			0,004
						0,172	0,166	0,049	0,185	0,207	2,295	0,003	0,058	0,030	31,708	0,001	0,003	0,976		0,183		0,759			0,053
																47,643	0,144	2,095				0,591			
																	230,253	0,975		0,357		1,351			
													1,382					212,954				4,361			
																			40,757			0,626			
																					44,474	1,941			
																						67,106	0,007		
																							147,525		
																	0,904					11,071	2,765	180,659	
																	0,848		0,581			0,950	0,183		95,084
																	1,011		2,719			1,797	0,600		
																	0,359		1,312			4,218	0,126		3,671
	0,147		0,056	0,020	72,118	0,004			0,086						0,002	0,006		0,927		0,325		1,525			0,130
					0,005	10,360	0,006	0,009	0,028	0,004	0,059	0,008	0,002		0,008	0,002		0,267		0,013		0,112			0,005
		0,046				0,006	105,110	0,017	0,010		0,067			0,010	0,403	0,169	0,035	0,878		0,454		1,592			0,158
				0,001		0,030	0,095	132,627	0,509		0,040	0,316	0,205		0,004	1,474		1,251		0,737		7,416			0,247
	0,002			0,037	0,213	0,161	0,361	1,647	83,500	0,010	2,310	0,621	0,576	0,069	0,318	0,030	0,005	1,765		0,347		2,823			0,089
				0,477		0,017			0,007	29,873		0,049				0,001	0,558	0,077		0,454		1,298			0,131
						0,004	0,018	0,010	0,425	0,035	47,557	1,481	1,346	0,175	0,123	0,001	0,064	0,812		0,511		3,941			0,170

Appendix1 SAM North Karelia 4/12

C-health	C-oth	F-RCA	F-UCA	F-AGC	F-RA	F-RH	F-UH	F-SL	F-UL	RFirm	Ufirm	H-Agr	H-Rw	H-Roth	H-Rcon	H-Uwo	H-Uoth	Rep-tour	NPISH	Atax	Stax	Ytax	Gov	ROW	S-I	TOTAL
								0	0																	144,284
																										21,294
								0	0																	244,710
								0	0																	5,461
								0	0																	63,666
								0	0																	128,293
								0	0																	20,221
								0	0																	266,751
								0	0																	269,198
								0	0																	176,214
								0	0																	61,176
								0	0																	105,252
								0	0																	134,764
								0	0																	39,130
								0	0																	7,815
								0	0																	36,848
								0	0																	50,474
	2,365							0	0																	235,300
								0	0																	218,697
	1,657							0	0																	43,039
								0	0																	46,414
								0	0																	67,113
								0	0																	147,525
0,207								0	0																	195,607
								0	0																	97,647
221,817								0	0																	227,945
2,148	82,633							0	0																	94,467
								0	0																	75,347
								0	0																	10,888
								0	0																	108,955
								0	0																	144,953
								0	0																	94,884
								0	0																	32,941
								0	0																	56,674

A-Umet																									
A-Umach																									
A-Ueeq																									
A-Utrq																									
A-UotherM																									
A-Uenergy																									
A-Uconst																									
A-Utrade																									
A-Uhotels																									
A-Ufinan																									
A-Ubusn																									
A-Uestate																									
A-Upublic																									
A-Ueduc																									
A-Uhealth																									
A-Uotherpr																									
A-Rtrans																									
A-Utrans																									
C-agri	35,074	1,311				39,657	0,028			1,281											0,822		0,012		0,107	
C-forest	0,007	0,000	31,208		0,003	0,007	0,001	90,024	17,488	0,002	0,083	0,004	0,002			0,060	0,301	0,069							
C-fis				1,166		0,684															0,215					
C-mining			0,084		8,067	0,208	0,035	0,079	6,510	1,517	3,893	0,248	0,032	0,003	0,002	0,005	8,921	3,251						0,009	0,003
C-food	16,975	1,882	0,316	0,199	0,601	34,054	0,184	1,973	4,069	2,051	0,504	0,553	1,346	0,251	0,056	0,323	0,460	0,422	1,230	8,318	0,145	0,244	0,305	0,749	0,409
C-text	0,003	0,029	0,048		0,110	0,132	6,938	0,582	0,471	1,583	0,569	0,256	0,359	0,057	0,026	0,910	0,083	0,536	2,015	0,107	0,048	0,111	0,040	0,242	0,086
C-timber	0,182	0,021			0,181	0,179	0,012	33,063	6,740	0,508	0,492	0,203	0,130	0,023	0,036	3,967	0,946	16,156	0,078		0,016	0,082	0,066	0,264	0,103
C-paper	0,106	0,106	0,298	0,003	0,592	3,100	0,256	2,696	45,997	2,719	0,743	0,541	1,027	0,209	0,041	0,387	0,320	0,441	4,698	0,258	0,207	0,761	0,225	1,721	0,978
C-coke	9,732	0,260	2,332	0,014	5,281	4,950	1,896	9,230	21,172	50,596	4,140	2,368	1,604	0,751	0,218	2,587	1,882	7,069	6,328	0,041	0,106	0,355	0,515	0,688	0,478
C-miner	0,235	0,026			0,054	0,623	0,001	2,934	0,273	0,929	8,055	0,898	0,233	0,047	0,058	0,291		16,536	0,602		0,011	0,019		0,151	0,051
C-metal	0,122	0,042	0,005		0,453	1,000	0,097	4,228	0,739	4,152	3,151	25,476	10,800	1,739	1,898	3,410	0,022	17,467	0,649	0,008	0,021	0,035	0,004	0,534	0,226
C-mach	0,764	0,139	0,011		8,430	2,330	0,108	2,939	6,500	1,614	2,554	3,459	33,998	0,318	0,986	0,425	2,664	9,095		0,672		0,025		1,955	0,206
C-eeq					0,127	0,096	0,009	0,408	0,544	5,581	0,156	2,300	4,819	9,176	0,607	0,253	0,184	5,399	6,207		1,044	1,408		3,651	0,312
C-Trq			0,481	0,008						0,126		0,155	6,256		0,530	0,039		0,017	2,301			0,001		1,944	0,002
C-otherM		0,006	0,007		0,008	0,010	0,380	0,209	0,031	0,028	0,062	0,775	0,151	0,004	0,194	2,549	0,006	3,091	1,410	0,133	0,250	0,170	0,006	0,238	0,132
C-energy	0,715	0,246	0,852	0,038	1,921	1,947	0,203	7,136	15,665	3,404	1,060	0,647	0,584	0,092	0,043	0,356	1,571	1,207	3,150	0,331	0,916	0,758	9,046	2,924	1,386
C-constr	0,578	0,086																16,557	0,259	0,594	0,566	5,638	15,704	0,303	0,341

		23,290	0,015			0,690										0,855		0,024		0,071					
		0,004		36,771	9,418	0,001	0,045	0,002	0,001			0,032	0,452	0,037											
		0,402														0,224		0,001							
0,008	0,002	0,122	0,019	0,032	3,506	0,817	2,096	0,134	0,029	0,003	0,002	0,003	13,380	1,751						0,006	0,006	0,007	0,002	0,002	0,001
0,424	0,411	20,001	0,099	0,806	2,191	1,104	0,271	0,298	1,194	0,223	0,050	0,174	0,689	0,227	0,890	8,658	0,151	0,473	0,592	0,500	0,794	0,347	0,298	0,606	0,371
0,339	0,169	0,077	3,736	0,238	0,254	0,853	0,306	0,138	0,318	0,051	0,023	0,490	0,125	0,289	1,459	0,112	0,050	0,216	0,077	0,161	0,167	0,277	0,123	0,104	0,064
0,267	0,515	0,105	0,006	13,506	3,629	0,273	0,265	0,109	0,116	0,020	0,032	2,136	1,418	8,700	0,057		0,017	0,159	0,129	0,176	0,201	0,218	0,373	0,003	0,002
1,289	1,763	1,821	0,138	1,101	24,770	1,464	0,400	0,292	0,911	0,185	0,037	0,208	0,480	0,238	3,402	0,268	0,215	1,477	0,436	1,147	1,897	1,055	1,277	1,087	0,666
4,930	1,862	2,907	1,021	3,770	11,401	27,245	2,229	1,275	1,422	0,666	0,193	1,393	2,822	3,806	4,582	0,043	0,110	0,689	0,999	0,459	0,928	4,034	1,348	5,367	3,290
0,365	0,088	0,366		1,199	0,147	0,500	4,338	0,484	0,207	0,041	0,052	0,157		8,905	0,436		0,011	0,038		0,101	0,098	0,298	0,064	0,002	0,001
0,415	0,168	0,587	0,052	1,727	0,398	2,236	1,696	13,718	9,577	1,542	1,683	1,836	0,033	9,405	0,470	0,009	0,021	0,069	0,007	0,356	0,439	0,340	0,122	0,699	0,428
0,185	0,069	1,368	0,058	1,201	3,500	0,869	1,375	1,863	30,148	0,282	0,874	0,229	3,996	4,897		0,700		0,049		1,304	0,401	0,151	0,050	0,018	0,011
1,563	1,114	0,056	0,005	0,167	0,293	3,005	0,084	1,239	4,273	8,137	0,538	0,136	0,276	2,907	4,495		1,087	2,732		2,434	0,606	1,278	0,806	5,174	3,172
0,002						0,068		0,083	5,547		0,470	0,021		0,009	1,666			0,003		1,296	0,003	0,001		1,739	1,066
1,109	0,186	0,006	0,204	0,085	0,017	0,015	0,034	0,417	0,134	0,004	0,172	1,373	0,009	1,665	1,021	0,139	0,260	0,330	0,012	0,159	0,256	0,908	0,135	0,036	0,022
3,461	2,244	1,144	0,110	2,915	8,436	1,833	0,571	0,348	0,518	0,082	0,038	0,192	2,357	0,650	2,281	0,345	0,954	1,472	17,550	1,950	2,690	2,831	1,625	1,248	0,765
0,053	0,115													8,915	0,187	0,619	0,589	10,943	30,472	0,202	0,662	0,043	0,084	6,161	3,776

					0,004	0,018	0,010	0,425	0,035	47,557	1,481	1,346	0,175	0,123	0,001	0,064	0,812		0,511		3,941			0,170	
					0,005			0,022	0,001	2,087	111,683	0,693	1,116	0,004	0,001	0,217	0,742		0,607		2,134			0,196	
							0,040	1,315		0,185	0,475	30,999	0,004			0,036	0,382		0,096		1,138			0,030	
						0,004		0,010		0,113	0,027	0,002	6,588		0,001	0,043	0,036		0,018		0,084			0,004	
					0,093	0,091	0,029	0,101	0,112	1,235	0,003	0,032	0,017	17,061	0,001	0,003	0,525		0,100		0,409			0,030	
															71,471	0,214	3,141				0,885				
																123,974	0,528		0,194		0,730				
												1,001					154,206				3,159				
																		42,420			0,651				
																				46,289	2,020				
																					130,268	0,012			
																						286,372			
																0,604					7,382	1,845	120,434		0,140
																1,643		1,127			1,840	0,350		184,589	
																0,828		2,225			1,471	0,492			181,484
																0,261		0,950			3,055	0,092		2,659	1,556
																	1,011	0,033	227,736		0,951	0,007			
																	0,622	0,021	139,574		0,585	0,006			

							0	0																	56,674
							0	0																	119,508
							0	0																	34,700
							0	0																	6,930
							0	0																	19,841
							0	0																	75,711
1,274							0	0																	126,700
							0	0																	158,367
1,724							0	0																	44,796
							0	0																	48,309
							0	0																	130,280
							0	0																	286,372
							0	0																	130,405
							0	0																	189,550
							0	0																	186,500
60,161							0	0																	68,735
							0	0																	229,738
							0	0																	140,807
							0	0			5,107	8,116	14,986	2,166	5,997	7,368	1,144					0,000	48,859	-0,519	196,461
							0	0			0,353	2,955	2,213	0,683	2,146	1,070	0,246					0,000	76,054	3,883	275,628
							0	0			0,158	0,864	0,645	0,192	0,625	0,306	0,073					0,000	2,271	0,002	7,826
							0	0			0,000	0,000	0,000	0,000	0,000	0,000	0,000					0,000	38,241	1,861	94,898
							0	0			10,077	35,320	35,275	8,194	25,660	17,007	3,441					0,000	150,155	-0,255	404,337
							0	0			0,437	14,575	1,868	2,653	10,329	0,498	0,794					0,086	19,021	1,967	77,784
							0	0			0,055	0,299	0,223	0,066	0,216	0,106	0,025					0,000	339,308	-1,577	434,599
							0	0			2,390	13,080	9,755	2,899	9,454	4,635	1,104					0,000	377,695	7,002	544,467
							0	0			3,682	13,456	5,061	6,037	10,068	3,051	7,236					15,962	207,337	1,502	496,778
							0	0			0,141	0,772	0,575	0,171	0,558	0,273	0,065					0,000	64,382	0,190	117,051
							0	0			0,143	0,784	0,585	0,174	0,567	0,278	0,066					0,000	85,592	5,239	217,738
							0	0			1,008	5,516	4,114	1,222	3,987	1,955	0,466					0,000	185,030	59,658	395,748
							0	0			2,014	8,703	4,426	2,353	6,442	2,389	0,689					0,000	56,673	83,962	255,510
							0	0			4,777	20,824	10,104	6,851	15,382	5,425	1,658					0,000	12,323	27,081	128,261
							0	0			0,772	7,540	3,026	1,552	5,501	1,534	0,521					0,000	50,633	3,521	93,162
							0	0			3,010	4,005	7,431	1,001	2,936	3,607	0,000					0,000	4,611	-0,001	141,410
							0	0			0,000	0,000	0,000	0,000	0,000	0,000	0,000					10,024	1,478	325,238	440,189

Appendix 1 SAM North Karelia 9/12

C-trade	21,081	1,338	3,361	0,786	0,935	2,022	0,223	2,238	0,897	3,039	0,838	1,279	5,943	0,223	0,251	1,131	0,337	35,136	18,363	5,080	2,337	3,878	3,676	10,887	2,866
C-hotel		0,091	0,185	0,003														0,258	1,218	0,224	0,559	0,346	0,156	3,936	1,266
C-transport	0,663	0,099	1,712	0,017	9,557	9,788	1,022	29,790	17,255	8,684	5,402	2,471	3,788	0,664	0,183	1,647	2,649	4,806	21,381	1,748	3,193	3,434	1,475	10,641	2,758
C-banking	0,968	0,310	1,091	0,037	0,629	1,139	0,234	2,196	3,138	2,009	0,554	1,160	1,864	1,128	0,218	0,407	0,611	2,493	2,847	0,582	2,705	1,139	4,488	3,332	1,145
C-busserv	1,517	1,957	2,381	0,020	3,776	10,581	2,249	12,882	22,903	12,545	5,240	4,865	12,842	3,023	0,474	3,358	4,106	13,848	18,598	2,713	2,308	7,073	3,529	21,915	7,350
C-estate																						0,009		0,224	0,045
C-publics	0,083	0,116	0,235	0,003	0,322	0,369	0,086	0,994	1,096	0,745	0,241	0,288	0,708	0,131	0,030	0,168	0,253	0,272	1,267	0,211	0,177	0,434	0,346	1,133	0,243
C-educ	0,015	0,015	0,034		0,044	0,052	0,012	0,140	0,156	0,105	0,033	0,041	0,101	0,019	0,004	0,023	0,036	0,038	0,203	0,030	0,245	0,243	0,038	1,119	1,001
C-health	1,890	0,021																				0,119		3,119	1,159
C-others	0,086	0,013	0,283	0,033	0,157	0,195	0,044	0,433	1,001	0,329	0,114	0,135	0,316	0,062	0,010	0,073	0,011	0,384	2,670	2,214	0,452	0,935	1,753	1,812	0,886
F-RCAP		2,902	174,989	2,974	11,953	8,911	1,311	26,994	55,313	28,558	5,993	23,991	15,798	14,432	0,871	6,138	16,701	10,910	44,383	3,860	15,917	13,055	0,000	13,890	7,441
F-UCAP			0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
F-AGCAP	75,460	7,296																							
F-RAgrLan	8,925																								
F-RH	0,000	0,000																					100,012		
F-UH	0,000	0,000																							
F-SL	6,404	0,945	7,896	0,088	3,413	4,838	1,823	7,695	13,015	12,104	5,564	12,522	12,042	2,591	0,406	2,640	3,769	21,093	9,057	4,408	5,048	22,053	0,327	67,797	44,762
F-UL	13,606	2,008	16,776	0,351	5,812	10,767	2,974	27,275	26,421	31,122	11,297	20,429	19,646	4,227	0,662	5,609	2,513	44,818	66,400	8,948	7,571	3,892	0,327	29,056	19,184
EN-RFirms	0,000	0,000																							
EN-UFirms	0,000	0,000																							
H-Agr	0,000	0,000																							
H-Rwork	0,000	0,000																							
H-Roth	0,000	0,000																							
H-Rcom	0,000	0,000																							
H-Uwork	0,000	0,000																							
H-Uoth	0,000	0,000																							
Rep-tourist	0,000	0,000																							
NPISH	0,000	0,000																							
Atax	-50,909	0,028	0,127	-0,279	1,240	-9,343	0,094	0,612	1,803	0,884	0,437	0,187	0,377	-0,037	0,012	0,091	2,128	3,931	3,383	1,522	2,571	0,880	5,489	11,266	2,827
Stax	0,000	0,000																							
Ytax	0,000	0,000																							
Gov	0,000	0,000																							
ROW	0,000	0,000																							
S-I	0,000	0,000																							
TOTAL	144,284	21,294	244,710	5,461	63,666	128,293	20,221	266,751	269,198	176,214	61,176	105,252	134,764	39,130	7,815	36,848	50,474	235,300	218,697	43,039	46,414	67,113	147,525	195,607	97,647

10,073	6,550	1,187	0,120	0,914	0,483	1,636	0,451	0,689	5,270	0,198	0,222	0,609	0,506	18,921	13,298	5,288	2,432	7,528	7,133	7,258	5,562	8,241	4,743	12,142	7,443
3,150	0,782													0,139	0,882	0,233	0,582	0,671	0,302	2,624	2,457	2,577	0,566	2,009	1,231
6,439	5,024	5,749	0,550	12,169	9,291	4,676	2,909	1,331	3,359	0,589	0,162	0,887	3,973	2,588	15,484	1,819	3,324	6,666	2,862	7,094	5,351	5,268	3,638	16,808	10,302
1,865	1,246	0,669	0,126	0,897	1,690	1,082	0,298	0,625	1,653	1,000	0,193	0,219	0,917	1,343	2,062	0,605	2,815	2,211	8,710	2,221	2,222	1,526	0,902	2,183	1,338
10,675	8,307	6,214	1,211	5,262	12,333	6,756	2,822	2,620	11,389	2,681	0,420	1,808	6,160	7,457	13,469	2,824	2,402	13,728	6,848	14,608	14,263	8,734	6,015	9,315	5,710
0,002	0,001																	0,018		0,149	0,087	0,001		0,002	0,001
0,699	0,555	0,216	0,046	0,406	0,590	0,401	0,130	0,155	0,628	0,116	0,027	0,090	0,379	0,147	0,917	0,219	0,184	0,842	0,671	0,755	0,471	0,572	0,402	0,995	0,610
1,470	1,604	0,031	0,006	0,057	0,084	0,057	0,018	0,022	0,089	0,017	0,004	0,012	0,054	0,020	0,147	0,031	0,255	0,472	0,074	0,746	1,942	1,203	1,162	0,279	0,171
3,749	0,484																	0,231		2,079	2,249	3,067	0,351	0,065	0,040
1,989	2,084	0,114	0,024	0,177	0,539	0,177	0,061	0,073	0,281	0,055	0,009	0,039	0,016	0,207	1,933	2,304	0,470	1,815	3,401	1,208	1,720	1,627	1,509	3,285	2,014
19,012	17,754	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	93,421	0,000
0,000	0,000	5,233	0,706	11,023	29,779	15,376	3,227	12,918	14,009	12,798	0,772	3,305	25,052	5,873	32,136	4,017	16,567	25,344	0,000	9,259	14,445	15,553	12,856	0,000	57,254
																			194,173						
65,886	16,187	2,841	0,982	3,142	7,007	6,517	2,996	6,742	10,679	2,297	0,360	1,421	5,654	11,357	6,558	4,588	5,254	42,815	0,635	45,199	86,904	53,909	11,722	14,326	8,781
80,524	20,973	6,323	1,602	11,139	14,226	16,757	6,083	11,000	17,423	3,748	0,587	3,020	3,770	24,131	48,085	9,314	7,881	7,556	0,635	19,371	37,245	65,887	15,516	42,972	26,338
8,001	4,208	-5,487	0,052	0,251	0,971	0,476	0,235	0,101	0,334	-0,033	0,010	0,049	3,192	2,117	2,450	1,585	2,676	1,707	10,654	7,510	5,486	6,546	3,048	9,691	5,939
227,945	94,467	75,347	10,888	108,955	144,953	94,884	32,941	56,674	119,508	34,700	6,930	19,841	75,711	126,700	158,367	44,796	48,309	130,280	286,372	130,405	189,550	186,500	68,735	229,738	140,807

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9,370	3,765	0,575	1,008	28,153	6,199	8,070	17,169	12,916	1,991	2,791	11,145	11,138	13,706	5,097	4,263	19,002	71,810	17,765	23,264	19,089	9,122	99,422	5,892	4,781	16,285
22,913	28,576	1,581	31,447	180,368	41,060	61,964	143,367	239,066	29,146	63,330	138,839	168,382	97,377	36,602	13,121	56,460	225,130	35,637	96,011	69,976	206,579		3,992	0,014	8,326
196,461	275,628	7,826	94,898	404,337	77,784	434,599	544,467	496,778	117,051	217,738	395,748	255,510	128,261	93,162	141,410	440,189	694,861	145,613	497,610	179,828	527,727	539,804	310,977	294,207	431,963

							0	0			17,756	122,599	84,657	25,354	88,435	39,881	4,644					13,746	30,070	10,675	694,861
							0	0			1,631	34,376	17,774	6,873	24,442	7,677	17,407					0,000	8,986	0,000	145,613
							0	0			6,440	40,262	20,928	8,705	28,791	9,355	14,643	3,056				18,952	62,461	0,878	497,610
							0	0			6,887	32,849	20,367	8,123	24,043	10,245	0,000					0,000	0,274	0,000	179,828
							0	0			0,903	4,944	3,687	1,096	3,573	1,752	1,472					25,109	26,601	92,510	527,727
							0	0			32,133	153,626	136,881	34,400	111,150	65,239	0,000					0,000	5,835	0,000	539,804
							0	0			1,365	7,472	5,573	1,656	5,401	2,648	0,000					254,931	10,758	0,000	310,977
							0	0			1,096	5,999	4,474	1,329	4,336	2,126	0,000	10,992				247,493	2,587	0,000	294,207
							0	0			4,189	18,145	26,689	3,825	13,046	12,548	0,000	13,336				308,763	12,803	0,000	431,963
							0	0			1,433	33,813	19,365	3,372	24,017	8,400	3,988	42,230				22,150	8,467	7,707	216,472
0	0	0	0	0	0	0	0	0			0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	637,474
0	0	0	0	0	0	0	0	0			0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	327,501
							0	0																	82,756
							0	0																	8,925
							0	0																	100,012
							0	0																	194,173
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	697,058
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	883,794
	382,484		24,044	2,593	19,706		0,000	0,000																	428,828
		196,501				38,259	0,000	0,000																	234,759
			58,712	6,332	5,737	1,868	17,287	24,670	21,162	1,977												17,174	1,592		156,512
					32,985	2,336	231,384	330,202	155,763	2,472												51,523	43,767		850,430
					5,996	0,467	0,000	0,000	22,787	0,494												498,053	0,000		527,798
					0,481	14,699	71,334	60,620	2,149	15,557												17,174	1,592		183,607
					2,678	64,125	183,733	227,615	12,003	67,868												34,349	32,626		624,997
					0,241	9,925	0,000	0,000	1,075	10,505												240,440			262,185
							0,000	0,000															59,684		59,684
							0,000	0,000			2,809	23,373	15,368	3,407	11,110	10,051						3,497			69,614
							0,000	0,000																	51,091
18,280							0,000	0,000																	442,066
									60,967	38,358	39,936	206,369	38,249	35,044	147,963	31,639									598,524
							169,896	216,683											51,091	442,066	598,524		383,200		1861,461
48,378	254,990	131,000			32,188	62,493	23,424	24,004																	2575,742
							0,000	0,000	152,922	97,529	5,807	29,793	33,502	14,211	38,822	11,123						82,036	164,777		630,522
216,472	637,474	327,501	82,756	8,925	100,012	194,173	697,058	883,794	428,828	234,759	156,512	850,430	527,798	183,607	624,997	262,185	59,684	69,614	51,091	442,066	598,524	1861,461	2575,742	630,522	

Appendix 2 (1/2)) Employment matrix, South Ostrobothnia

Industry	Employees	Rural	Urban	White collar total	Rural	Urban	Blue collar total	Rural	Urban
Agriculture and hunting	2 159	2 159		493	493		1 047	1 047	
Forestry	698	663	35	174	166	9	370	352	18
Fishing	6	0		1	1		4	4	
Mining and quarrying	348	264	83	160	122	38	158	120	37
Manufacture of food; beverag	2 988	2 241	747	1 188	894	295	2 753	2 071	682
Manufacture of textile, leather	982	952	29	265	257	8	528	512	16
Manufacture of wood and wo	1 690	1 656	34	398	390	8	1 299	1 274	26
Pulp, paper- and products; pub	515	437	77	365	311	54	250	213	37
Manufacture of coke, chemica	364	321	44	127	112	15	244	215	29
Manufacture of non-metallic m	371	282	89	84	64	20	308	235	73
Manufacture of metals and m	2 802	2 298	504	1 020	838	182	2 196	1 804	391
Manufacture of machinery an	2 388	2 102	287	1 285	1 133	153	1 639	1 445	195
Manufacture of electrical and	301	259	42	92	79	13	224	193	31
Manufacture of transport equi	1 013	871	142	247	213	34	898	774	125
Manufacturing n.e.c.	1 501	1 426	75	424	403	21	894	850	44
Electricity, gas, steam and wa	305	207	97	176	120	56	197	135	63
Construction	4 288	3 045	1 244	1 355	965	390	2 879	2 051	828
Wholesale and retail trade	8 077	5 411	2 665	813	547	266	5 960	4 008	1 952
Hotels and restaurants	1 193	764	430	297	191	106	603	387	215
Transport, storage and commu	3 686	2 322	1 364	879	556	323	2 638	1 669	969
Financial intermediation	1 098	406	692	458	171	287	974	363	611
Real estate, renting and busine	2 567	1 694	873	2 204	1 460	744	389	258	131
Letting of own property	65	52	13	22	18	4	22	18	4
Public administration and soci	4 356	2 744	1 612	3 069	1 942	1 127	1 315	832	483
Education	5 066	3 445	1 621	4 402	3 004	1 398	1 886	1 288	599
Health and social work	10 285	7 097	3 188	4 711	3 262	1 449	5 758	3 987	1 771
Other social and personal serv	3 452	2 347	1 105	1 089	743	346	1 331	908	423
Total	**62 563**	**45 465**	**17 098**	**25 799**	**18 454**	**7 345**	**36 764**	**27 011**	**9 753**

Appendix 2 (2/2) Employment matrix, North Karelia

	Industry	Employees	Rural	Urban	White collar total	Rural	Urban	Blue collar total
A 01	Agriculture and hunting	1107	166		166	941		941
A 02	Forestry	896	134		134	762		762
B	Fishing	26	3		3	23		23
C	Mining and quarrying	272	86		86	185		185
DA	Manufacture of food; beverages	799	140	82	222	364	214	578
DB, DC	Manufacture of textile, leather a	320	52	28	81	156	84	240
DD	Manufacture of wood and wooc	1506	194	79	274	875	357	1232
DE	Pulp, paper- and products; publi	1612	267	144	410	781	420	1201
DF-DH	Manufacture of coke, chemical	2265	315	169	484	1157	623	1780
DI	Manufacture of non-metallic mi	824	138	74	212	398	214	613
DJ	Manufacture of metals and met	1569	299	161	461	720	388	1108
DK	Manufacture of machinery and	1649	257	228	484	618	548	1165
DL	Manufacture of electrical and o	498	77	69	146	186	165	352
DM	Manufacture of transport equipr	63	10	9	18	24	21	45
DN	Manufacturing n.e.c.	475	91	49	140	218	118	336
E	Electricity, gas, steam and wate	422	97	145	242	72	108	180
F	Construction	3175	375	202	577	1688	909	2598
G	Wholesale and retail trade	5351	683	494	1177	2421	1753	4173
H	Hotels and restaurants	1263	93	97	190	526	548	1074
I	Transport, storage and commun	3116	290	178	467	1642	1006	2648
J	Financial intermediation	654	176	184	360	144	150	294
K excl. 70	Real estate, renting and busines	2403	368	714	1081	449	872	1322
K 7021	Letting of own property	97	15	29	44	18	35	54
L	Public administration and social	5623	1856	1237	3093	1518	1012	2530
M	Education	5405	1305	2533	3838	533	1035	1567
N	Health and social work	9593	2216	1813	4029	3060	2504	5564
O	Other social and personal servic	2412	392	284	675	1007	729	1737
P	Household service activities	530	40	40	80	225	225	451
		53925	**10133**	**9040**	**19172**	**20713**	**14040**	**34753**

Appendix 3 Calculations of investments and value-added price

Fixed investments are counted in the model as follows:

```
qbarinv(c)$CINV(C) = SAM(C,'S-I')/PQ0(C);
QINV0(C)          = qbarinv(C);
IADJ0             = 1;

INVDEM(C)$CINV(C)..  QINV(C) =E= IADJ*qbarinv(C);
```

For example, concerning North Karelia, IADJ was 1 in base solution, 1.094 in Modern and 1.121 in Traditional simulation.

Calculation of the value-added price of agricultural activity.

```
PVADEF(A)..  PA(A)*(1-ta(A))*QA(A) =E= PVA(A)*QVA(A) + PINTA(A)*QINTA(A)


---- PVADEF  =E=  value-added price
PVADEF(A-Ragri)..  (19.5192528763356)*PA(A-Ragri)
        - (8.36046206811718)*PINTA(A-Ragri) - (10.439503425174)*PVA(A-Ragri)
        + (1.35283827922794)*QA(A-Ragri) - (1.0860344054173)*QINTA(A-Ragri)
        - (1)*QVA(A-Ragri) =E= 0 ; (LHS = 0)
Where:
PINTADEF(A)    price of aggregate intermediate
PINTA0(A)      price of intermediate aggregate input
pinta0(A)     = SUM(C, ica(C,A)*PQ0(C)) ;
QINTA0(A)      quantity of aggregate intermediate input
QA(A)          level of domestic activity
```

Appendix 4 Sensitivity analysis, trade elasticities.

		South Ostrobothnia			North Karelia		
σ		0.8	2.0	4.0	0.8	2.0	4.0
Diversified farms	Private consumption	-0.01	-0.01	-0.007	-0.021	-0.01	-0.008
	Investments	1.009	1.28	1.645	1.013	1.39	1.748
	Exports	-0.109	-0.11	-0.125	-0.054	-0.07	-0.075
	Imports	0.064	0.12	0.197	0.149	0.24	0.324
	GDP at factor costs	-0.025	-0.02	-0.01	0.006	0.02	0.025
Modern Investment	Private consumption	-1.164	-1.06	-0.935	-0.476	-0.41	-0.337
	Investments	18.862	24.06	31.799	7.602	11.03	14.94
	Exports	-0.494	-0.6	-0.874	-0.285	-0.38	-0.474
	Imports	2.771	3.98	5.712	1.228	2.06	3.028
	GDP at factor costs	0.409	0.51	0.628	0.136	0.23	0.311
Traditional Investment	Private consumption	-0.639	-0.45	-0.355	-0.318	-0.25	-0.186
	Investments	20.759	28.49	37.822	9.764	13.93	17.587
	Exports	-0.2	-0.59	-1.306	-0.213	-0.47	-0.616
	Imports	3.286	4.73	6.485	1.84	2.72	3.58
	GDP at factor costs	0.837	1.04	1.12	0.296	0.4	0.47
Infrastructure efficiency	Private consumption	1.02	1	0.93	1.347	1.38	1.389
	Investments	9.69	10.58	10.17	12.463	12.55	12.022
	Exports	0.71	-0.04	-0.98	1.276	1.01	0.53
	Imports	1.9	1.41	0.43	3.127	2.83	2.175
	GDP at factor costs	1.49	1.51	1.47	1.869	1.94	1.9993
Transport cost cut	Private consumption	0.93	0.83	0.78	0.504	0.48	0.469
	Investments	-18.4	-30.03	-42.02	-10.432	-15.32	-22.097
	Exports	5.3	7.07	8.9	3.08	3.89	5.049
	Imports	-0.77	-2.05	-3.42	-1.034	-1.7	-2.607
	GDP at factor costs	0.37	0.26	0.204	-0.008	-0.04	-0.05
Tourist household	Private consumption	0.209	0.209	0.21	0.234	0.236	0.237
	Investments	0.204	0.2	0.198	0.263	0.248	0.24
	Exports	-0.111	-0.088	-0.07	-0.102	-0.084	-0.069
	Imports	0.133	0.155	0.173	0.197	0.214	0.228
	GDP at factor costs	0.039	0.039	0.039	0.054	0.053	0.054
Hotels and catering	Private consumption	0.008	0.007	0.002	0.054	0.041	0.01
	Investments	0.052	-0.008	-0.198	0.285	-0.304	-1.825
	Exports	0.005	0.012	0.031	0.037	0.104	0.247
	Imports	0.014	0.006	-0.024	0.095	-0.007	-0.292
	GDP at factor costs	0.008	0.006	0.002	0.044	0.032	0

Appendix 5 Directions of the main economic indicators.[3]

		Regional GDP					Exports		Imports				
		Total	Rural	Urban	Empl.	Invest.	Total	A/T/H	Total	A/T/H	Foreign sav	Gov. Sav.	HH cons.
Diversified farms	SO	-	-	+	+	+	-	-	+	-	+	+	-
	NK	+	-	+	+	+	-	-	+	-	+	+	-
Modern Investment	SO	+	+	+	+	+	-	-	+	+	+	+	-
	NK	+	+	+	+	+	-	-	+	+	+	+	-
Traditional Investment	SO	+	+	+	+	+	-	-	+	-	+	+	-
	NK	+	+	+	+	+	-	-	+	0	+	+	-
Infrastructure efficiency	SO	+	+	+	+	+	-	+	+	-	+	+	+
	NK	+	+	+	+	+	+	+	+	-	+	+	+
Transport cost cut	SO	+	+	-	+	-	+	-	-	-	-	-	+
	NK	-	-	+	-	-	+	-	-	-	-	+	+
Tourist household	SO	+	+	+	+	+	-	+	+	+	0	-	+
	NK	+	+	+	+	+	-	+	+	+	0	-	+
Hotels and catering	SO	+	+	+	+	-	+	+	+	-	-	+	+
	NK	+	+	+	+	-	+	+	-	-	-	+	+
		Price of value ad		Producer price		Consumer price							
		Total	A/T/H	Total	A/T/H	Total	A/T/H	Agri cap	Agri land	Rural cap	Urban cap		
Diversified farms	SO	+	-	+	+	+	+	+	-	+	+		
	NK	+	-	+	+	+	+	-	-	+	+		
Modern Investment	SO	+	-	+	+	+	+	-	-	+	+		
	NK	-	-	+	+	+	+	-	-	+	+		
Traditional Investment	SO	+	-	+	+	+	+	-	-	+	+		
	NK	-	-	+	+	+	+	-	-	+	+		
Infrastructure efficiency	SO	+	-	+	-	+	-	+	+	+	+		
	NK	+	-	+	-	+	-	+	+	+	+		
Transport cost cut	SO	+	+	-	-	-	-	+	+	+	-		
	NK	+	+	-	-	+	-	+	+	+	+		
Tourist household	SO	-	+	+	+	-	+	-	-	+	+		
	NK	-	+	+	+	-	+	-	-	+	+		
Hotels and catering	SO	+	+	-	-	-	-	+	+	+	+		
	NK	+	+	+	-	+	-	+	+	+	+		

[3] A= agricultural products, T= Transport services, H= Hotel and catering services

Appendix 6 SAM accounts.

Activities:
Agriculture, hunting and related services
Diversified activity (agricultural activity)
02 Forestry and related services
Fishery
C Mining and quarrying
DA Rural Manufacture of food products, beverages and tobacco
DB_DC Rural Manufacture of textiles, leather and leather products
DD Rural Manufacture of wood and wood products
DE Rural Manufacture of pulp, paper and paper products; publishing and printing
DF_DG_DH Rural Manufacture of coke, chemical products, rubber and plastic products
DI Rural Manufacture of non-metallic mineral products
DJ Rural Manufacture of basic metals and fabricated metal products
DK Rural Manufacture of machinery and equipment
DL Rural Manufacture of electrical and optical equipment
DM Rural Manufacture of transport equipment
DN Rural Other manufacture and recycling
E Rural Electricity, gas and water supply
F Rural Construction
G Rural Trade
H Rural Hotels and restaurants
I Rural Transport, storage and communication
J Rural Financial intermediation
K Rural Real estate and business activities
K7021 Rural Real estate and renting
L Rural Public administration and compulsory social security
M Rural Education
N Rural Health and social work
O Rural Other community, social and personal service activities
02 Urban Forestry and related services
C Urban Mining and quarrying
DA Urban
DB_DC Urban
DD Urban
DE Urban
DF_DG_DH Urban
DI Urban
DJ Urban
DK Urban
DL Urban
DM Urban
DN Urban
E Urban
F Urban
G Urban
H Urban

I Urban Transport, Storage and Communication

J Urban
K Urban
K7021 Urban
L Urban
M Urban
N Urban
O Urban

Commodities:
A01 Cereals, vegetables, potatoes, fruits, fodder plants, plant seedlings and seeds, mushrooms, berries, flowers, living animals, eggs, honey etc. non processed agricultural and game products and related services
A02 Logs, tree seedlings, firewood, chip, forest cultivation, harvesting and other forestry services
B05 Fish, and fishery services
CA_CB Coal, turf, ore, minerals, gravel, rock, sand, lime etc.
DA Processed food products, beverages, alcoholic beverages, tobacco products
DB_DC Textiles, fibres, fabrics, rugs and carpets, clothes, leather, foot wear, etc.
DD Board, panel, plywood, window frames, etc building and packing wood, cork
DE 21_22Pulp, paper, paperboard, cardboard, toilet paper, wall paper etc. Books, newspapers, journals, records, postcards, printing and related services, copying of records, videos and computer soft ware
DF_DG_DH Petrol, diesel, fuel oil etc. fuels, nuclear fuel, propane, butane etc. Colours and pigments, other chemicals, acids, fertilizers, paints and varnishes, medicinal preparations, detergents, perfumes, explosives, glues, additives, synthetic fibres, rubber products, plastic products
DI Glass and glass products, ceramic products, bricks, cement and concrete products, other non metal mineral products
DJ Iron , steel , aluminium, lead, pewter and other metals, metal casting, Metal products excl. machinery and equipment (containers, metal construction, tools, cutlery, etc.
DK Machinery and equipment and related services
DL Electronic equipments; computers, office equipment, electric motors, televisions, radios, optical equipments, etc.
DM Vehicles: cars, trailers, boats, trains, motorbikes, bicycles etc.
DN Other products: Furniture, sports equipment, musical instruments, toys, jewellery,
E Energy and water
F Construction services
G Retail and wholesale trade, Vehicle and equipment repair and service, fuel retail trade, trade services
H Hotel, restaurant and catering services
I Transportation, telecommunication, postal services, travel agency services
J Banking and insurance services

K Services for businesses: equipment renting and repairing, maintenance services, technical , economic, commercial , cleaning and juridical services
K 7021 Real estate and renting services
L Public administration
M Education
N Health and social services
O Other public and personal services: culture and entertainment, library, sport and recreation services, environmental care

Factor accounts:
Capital rural
Capital urban
Capital agriculture
Agricultural Land
Rent rural housing
Rent urban housing
Rural white collar labour
Rural blue collar labour
Urban white collar labour
Urban blue collar labour

Firms and Households:
Rural Firms
Urban Firms
Rural Agricultural HHs
Rural Working HHs
Rural Other HHs
Rural Commuter HHs
Urban Working HHs
Urban Other HHs
Tourist HH
Non-profit organisations serving households (NPISH)

Government accounts:
Activity taxes
Sales taxes
Income taxes
Factor taxes
Government

Rest of the World
Savings-Investments
TOTAL

Appendix 7 Location of South Ostrobothnia and North Karelia.